

<https://doi.org/10.46344/JBINO.2021.v010i01.16>

## LINKS BETWEEN MOISTURE CONTENT OF BIOMASS OF (*CREMASTRA APPENDICULATA*) AND ELEVATIONS BY LONG-TIME INVESTIGATION AND QUALITATIVE ANALYSIS AND QUANTITATIVE STATISTICS OF "BIG DATA"

Bing-Hua Liao<sup>1,2</sup>

(1. The Key Laboratory of Ecological Restoration in Hilly Areas, Forestry Department of Henan Province, Institute of chemistry and environmental engineering, Ping-ding-shan University, Ping-ding-shan City, 467000, China; 2. Institute of life and science, Henan University, Kai-feng City, He-nan Province, 475004, China)

### ABSTRACT

(*Cremastra appendiculata*) of treating lumbago and arthritis not only is a vital medicinal material plant, but also it is a widely distributed wide plant species. This plant species is widely distributed elevation from 500m to 3100m in Mei County of China. However, understanding dynamics of moisture content of biomass of this species is difficult along elevation. This research explained that links between moisture content of biomass of this species and elevation is the significant positive correlation from 500m to 1500m ( $P < 0.01$ ) as well as the links between moisture content of plant biomass and elevation are the significant negative correlation from 1500m to 3100m ( $P < 0.01$ ). This study provides six natural ecosystem types and a series of areas ecological adaptation for finding new species. Therefore, this study has vital theoretical and practical significance for medicinal plant species protection at the spatial-temporal-environmental-disturbance scales (STEDS).

**Key Words:** moisture content of biomass; elevation; links; areas ecological adaptation; medicinal species.

## INTRODUCTION

More and more research has assessed the correlation among biomass (average height, numbers, biodiversity) of plant species and elevation from biomass (average height, numbers, biodiversity) of the medicinal plant perspective (Table 1)<sup>1-11</sup> for better future of human health (ecosystems)<sup>6-11</sup>. However, medicinal species with typical history spanning over 1500 years, and areas ecological adaptation of a lot of moisture content of biomass are unknown, as well as cognitive ecological theory of links between moisture content of biomass and elevation gradient can be unknown<sup>12-19</sup>.

Thus, understanding these medical values of medicinal spices, as well as the links between moisture content of biomass of different areas ecological adaptation and elevation gradient is a vital ecological rule along elevation and environmental gradient in the natural ecosystem types.

(*Cremastra appendiculata*) not only is

vital medicinal material of treating lumbago and arthritis, but also is widely distributed wide specie in *Mei County* of China. This specie is belonging to *Cremastra* genus of Orchidaceae families of Monocotyledoneae in Angiospermae. Understanding moisture content of this species biomass is unknown, however. Indeed, our research not only explained that there are links between moisture content of this species biomass and elevation, but also explained that this species is a plant treating lumbago and arthritis by better future of human health and ecosystem functions, ecosystem services and ecosystem procession.

Therefore, there are some vital rules that the correlations between moisture content of this plant species biomass of (*Cremastra appendiculata*) vital medicinal material of treating lumbago and elevation in vegetation landscapes of *Mei County* of China at the STEDS.

**Abbreviation: STEDS, the spatial-temporal-environmental-disturbance scales.**

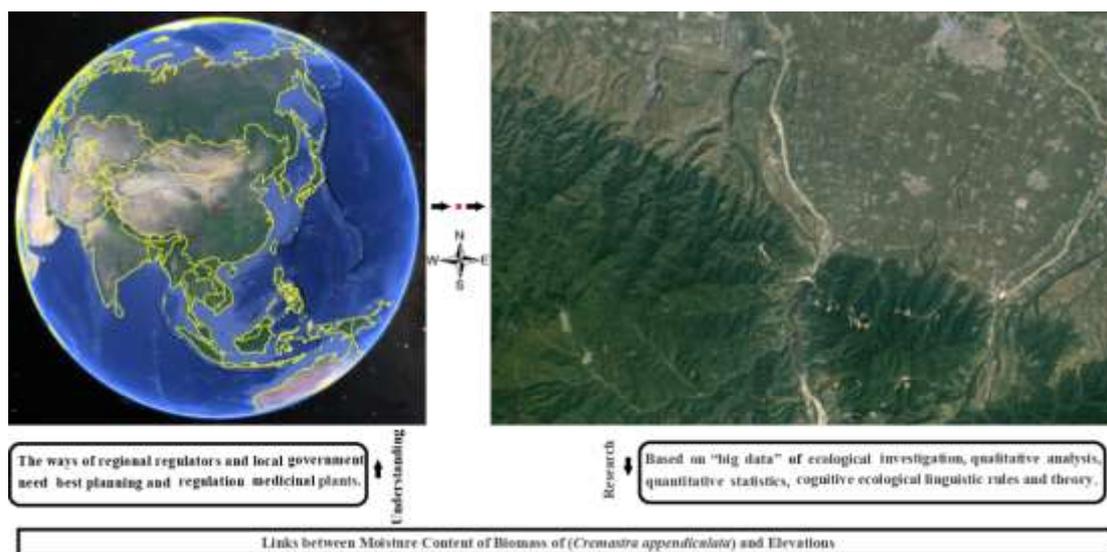
**Table.1 Links between medicinal plant biomass (number, height, biodiversity) and elevation**

| Links between medicinal plant biomass (biodiversity, height) and elevation     | Authors                             |
|--|-------------------------------------|
| Links between elevation environments and numbers of plant species at STEDS.    | Liao, et al., 2010 <sup>1</sup> .   |
| Links between biomass of medicinal herb and elevation in wetland landscape.    | Liao, et al., 2011a <sup>2</sup> .  |
| Links between plant functional number and elevation in forest landscape.       | Liao, et al., 2011b <sup>3</sup> .  |
| Links between plant functional number and elevation in near-natural forests.   | Liao, et al., 2014a <sup>4</sup> .  |
| Links between herbs number and disturbance of different elevation in wetland.  | Chen, et al., 2019 <sup>5</sup> .   |
| Links between number of medicinal tree species and elevation in forestation.   | Liao, et al., 2019a <sup>6</sup> .  |
| Links between number of medicinal tree trunk volume and elevation at STEDS.    | Liao, et al., 2019b <sup>7</sup> .  |
| Links between height of medicinal tree and elevation in the natural landscape. | Liao, et al., 2019c <sup>8</sup> .  |
| Links between number of tree community crown volume and elevation in forest.   | Liao, et al., 2019d <sup>9</sup> .  |
| Links between number of tree individual specie's crown volume and elevation.   | Liao, et al., 2019e <sup>10</sup> . |
| Links between herbs number and different disturbance of different elevation.   | Liao, 2014 b <sup>11</sup> .        |

**Typical environmental condition, situation of typical vegetation and methods of research**

Typical area is local in three zones: firstly, evergreen vegetation of north subtropical zone; secondly, evergreen and deciduous coniferous and broad-leaved mixed forest of north subtropical and warm

temperate transition; thirdly, deciduous vegetation of warm temperate zone in Earth. Thus, our research area is local in evergreen and deciduous coniferous and broad-leaved mixed forest in north subtropical and warm temperate transition in Mei County of China (Figure 1).



**Figure 1. A Digital Cadaster Map and Research Methods of Typical Location in Mei County of China of Earth.**

There are long-time investigation of links between moisture content of medicinal plant biomass and elevation from 2005 to 2019. Investigation of “big data” included that moisture content of medicinal plant or other index of plant species along environments by our previous researches<sup>2-11</sup>.

Thus, there is the links between moisture content of medicinal plant biomass and elevation, as well as there is a series of (good, better, best) natural landscapes areas ecological adaptation of moisture content of medicinal plant biomass by the “big data” of the ecological investigation, qualitative analysis, quantitative statistics, human cognitive ecological linguistic rules, theories, methods and ways along elevation and environmental gradient at

the STEDS by the long-time wild investigation and qualitative analysis and quantitative statistics of “Big Data”<sup>4-25</sup>.

## Results and Analysis

Based on “big data” of plant species investigation, this species is a widely distributed wide species along elevation from 500m to 3100m. (*Cremastra appendiculata*) is a widely distributed along elevation from 500m to 3100m in Mei County of China. However, understanding the elevation effect on the links between moisture content of plant species biomass and elevation is very difficult, because elevation effect on moisture content of medicinal plant biomass<sup>2-16, 20-26</sup>.

Using the dynamics of “big data”

investigation, this research suggested there are four rules:

Firstly, this research suggested that there is not only increasing of moisture content of (*Cremastra appendiculata*) biomass with increasing of elevation from 500m to 1500m, as well as there are but also decreasing of moisture content of (*Cremastra appendiculata*) biomass with increasing of elevation from 1500m to 3100m at the STEDS in Mei County of China (Figure 2).

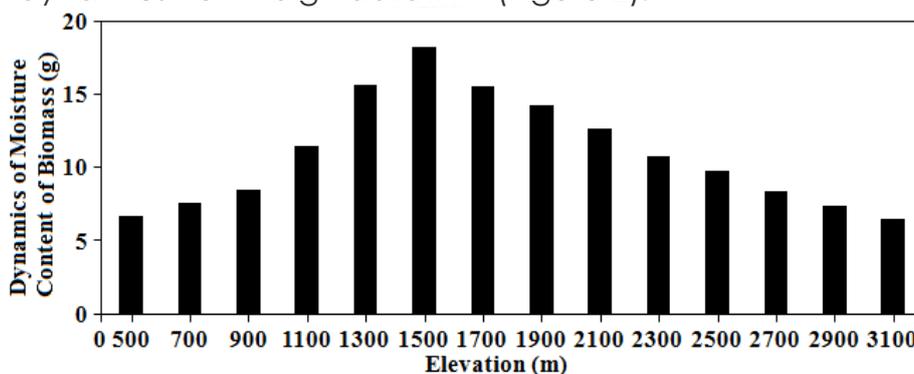


Figure2. Dynamics of Moisture Content of this Species Biomass along Elevation Gradient

Secondly, this study explained that there is the significant positive correlations between moisture content of (*Cremastra appendiculata*) biomass and elevation from 500m to 1500m along elevation gradient ( $P < 0.01$ ), and there is the

significant negative correlations between moisture content of (*Cremastra appendiculata*) biomass and elevation from 1500m to 3100m along elevation gradient at STEDS in Mei County of China ( $P < 0.01$ ) (Table 2).

Table.2 Correlation between Moisture Content of Biomass and Elevation Gradient

| Elevation (m)               | Elevation From 500m to 1500m | Elevation From 150m to 3100m |
|-----------------------------|------------------------------|------------------------------|
| moisture content of biomass | 0.968**                      | -0.990**                     |

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

Thirdly, this research provides a good areas ecological adaptation of (*Cremastra appendiculata*) from 500m to 3100 in Mei County in China. Meanwhile, this research proposed that there is not only the better

area ecological adaptation of (*Cremastra appendiculata*) from 1000m to 2000m, there is but also the best areas ecological adaptation of (*Cremastra appendiculata*) from 1300m to 1700m; because there are

results that there are not only dynamics of different air environmental factors, there are but also dynamics of different soil environmental factors from 500m to 3100m by dynamics of moisture content of (*Cremastra appendiculata*) biomass in Mei County (Figure 2).

Fourthly, this research proposed that medicinal plant species (*Cremastra appendiculata*) is local in six natural ecosystem (mixed natural ecosystem between forestation and grassland, natural forestation ecosystem, mixed natural ecosystem between forestation and wetland, mixed natural ecosystem between river and forestation, mixed natural ecosystem between forestation and urban, mixed natural ecosystem between forestation and rural settlement) by the "big data" of moisture content of (*Cremastra appendiculata*) biomass investing along elevation, because there may be results that there are not only dynamics of air environments, there are but also dynamics of soil environmental factors from 500m to 3100m by the dynamics of moisture content of (*Cremastra appendiculata*) biomass along elevation gradient at STEDS in Mei County of China.

Thus, this research found a series of typical (good, better, best) areas ecological adaptation of (*Cremastra appendiculata*) of treating lumbago and arthritis along elevation gradient, as well as there is the links between moisture content of this plant biomass and elevation gradient at STEDS.

## Conclusion and Discussion

Understanding medicinal plant species is very difficult<sup>1-16, 27- 33</sup>. This research suggested three rules between moisture content of (*Cremastra appendiculata*) biomass and elevation gradient:

1. This research suggested that there is increasing of moisture content of (*Cremastra appendiculata*) biomass with increasing of elevation from 500m to 1500m, as well as there is decreasing of moisture content of (*Cremastra appendiculata*) biomass with increasing of elevation from 1500m to 3100m (Figure 2). There is the significant positive correlation between moisture content of (*Cremastra appendiculata*) biomass and elevation from 500m to 1500m ( $P<0.01$ ) as well as there is the significant negative correlation between moisture content of (*Cremastra appendiculata*) biomass and elevation from 1500m to 3100m along elevation ( $P<0.01$ ) (Table 2).

2. This research provides six natural ecosystem types (forestation, mixed between forestation and grassland, mixed between forestation and wetland, mixed between forestation and river, mixed between forest and urban, mixed between forestation and rural settlement), as well as there is a series of areas ecological adaptation (a good areas ecological adaptation from 500m to 3100, the better area ecological adaptation from 1000m to 2000m, the best areas ecological adaptation from 1300m to 1700m ) for finding (*Cremastra appendiculata*) by dynamics of moisture content of (*Cremastra appendiculata*) biomass at STEDS in Mei County of China.

3. (*Cremastra appendiculata*) not only is a vital medicinal material of treating lumbago and arthritis, but also it is belonging to *Cremastra* genus of Orchidaceae families of Monocotyledoneae in Angiospermae, as well as it is widely distributed wide specie by the "big data" long-time investigation of moisture content of (*Cremastra appendiculata*) biomass in Mei County at STEDS.

Therefore, this research has a vital theoretical and practical significance for the reasonable protection of (*Cremastra appendiculata*) along different elevation gradient in the different ecosystems, because this plant species not only is an important widely distributed wide medicinal material plant by treating lumbago and arthritis, but also there are three rules by the links between moisture content of (*Cremastra appendiculata*) biomass and elevation in Mei County of China. Indeed, better regional regulators and local government need better planning and regulation a lot of medicinal plant management sustainability of communities by the research on moisture content of (*Cremastra appendiculata*) biomass (biodiversity, height, number, et al.) based on dynamics of linkages among biodiversity, elevation, environmental factors in local, regional, global ecosystems for better future of ecosystem services and human health at the STEDS by the long-time wild investigation and qualitative analysis and quantitative statistics of "Big Data"<sup>1-15,34-41</sup>.

### Acknowledgement

This work was supported by A Grade of Key Disciplines of Environmental Science Foundation, B Grade of Key Disciplines of Mistrals Science of Ping-Ding-shan University in China; Science and Technology Department of He'nan Province Foundation (KJT-17202310242; 092102110165); Subprojects by Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES); and better ideas of researchers of "1st Biotechnology World Congress" in 2011, "2st Biotechnology World Congress" in 2012, "3st Biotechnology World Congress" in 2013 is appreciated.

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