



**INTERRELATIONS OF BIOMASS OF (SMILAX SCOBINICAULIS) STEMS
CUTICLE AND DAILY SOLAR RADIATION ALONG DIFFERENT
ELEVATION ENVIRONMENTAL GRADIENT**

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Article Received on 11/09/2021

Article Revised on 01/10/2021

Article Accepted on 21/10/2021

ABSTRACT

Smilax scobinicaulis) not only is a vital medicinal material plant by treating joint pain, but also it is a widely distributed wide plant species from 500m to 3100m in *Mei County* of China. However, understanding links between total biomass of stems cuticle and daily solar radiation is difficult. This study explained that there is the increasing of total biomass of stems cuticle with increasing of daily solar radiation as well as links between total biomass of stems cuticle and daily solar radiation is the significant positive correlation from 20.578mol/m²•d to 24.158mol/m²•d along elevation from 500m to 1500m ($P < 0.01$); there are decreasing of this total biomass of stems cuticle with increasing of daily solar radiation as well as the links between this total biomass of stems cuticle and daily solar radiation is the significant negative correlation from 24.15mol/m²•d to 27.246mol/m²•d along elevation from 1500m to 3100m ($P < 0.01$). This research provides a series of areas ecological adaptation of daily solar radiation and six landscapes of this species. Therefore, this has vital theoretical and practical significance by medicinal plant species protection for better future of ecosystem services and eco-functions along daily solar radiation and elevation gradient.

KEYWORDS: biomass of stems cuticle; daily solar radiation; links; medicinal; areas ecological adaptation.

INTRODUCTION

More and more researches have assessed the links between total biomass of stems cuticle of medical plants and environments along elevation from total biomass of stems cuticle (plant functional groups, biodiversity, height, total biomass of stems cuticle) of medicinal plant species perspective by biodiversity researches (Table 1).^[1-21] which based on better future of human health by the finding medicinal plants. However, traditional medicinal plant species with typical history spanning over 1500 years, as well as areas ecological adaptation of total biomass of stems cuticle of plant are unknown and values of medicinal species also cannot be utilized.^[12-21]

(*Smilax scobinicaulis*) not only is a vital medicinal material plant of treating joint pain, but also it is widely distributed wide specie along elevation from 500 to 3100m by “big data” of our long-time investigation in *Mei County*. The species is belonging to *Smilax L.* genus of Liliaceae families of Monocotyledoneae in Angiospermae. However, understanding the links between total biomass of stems cuticle of medical plants and dynamics of daily solar radiation along elevation is

unknown, as well as the links between total biomass of stems cuticle of plants and daily solar radiation is difficult finding along elevation and environmental gradient in the typical areas.^[1-21]

At the same time, elevation and environmental (daily solar radiation, disturbances) gradient also influence on total biomass of stems cuticle (biomass, biodiversity, structure, et al.) of plant species in “big data” investigation of our long years researches Understanding these medical values of medicinal spices and the links between total biomass of stems cuticle of medicinal plant and the daily solar radiation and different areas ecological adaptation of medical plants is a vital rule.

Therefore, there is not only the vital links between total biomass of stems cuticle of species and daily solar radiation, but also there is a series of (good, better, best) this species areas ecological adaptation of daily solar radiation in six near-natural ecosystem for the better future along the different environments at the spatial-temporal-environmental-disturbance scales (STEDS).

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

Table 1: Evaluation of links between of medicinal plant dynamics and environmental factors.

Assessments of links between multilevel medicinal plant and elevation	Authors
Links between biodiversity of plant functional groups and elevation at STEDS.	Liao, et al., 2010. ^[1]
Links between biomass of medicinal herbs and elevation in wetland landscape.	Liao, et al., 2011 a. ^[2]
Links between plant functional groups diversity and elevation in forest.	Liao, et al., 2011 b. ^[3]
Links between plant functional groups and elevation in near-natural forests.	Liao, et al., 2014 a. ^[4]
Links between number of medicinal tree species and elevation in forestation.	Liao, et al., 2019 a. ^[5]
Links between average height of medicinal tree and elevation in landscapes.	Liao, et al., 2019 b. ^[6]
Links between medicinal tree trunk volume and elevation in forests.	Liao, et al., 2019 c. ^[7]
Links between number of tree community crown volume and elevation.	Liao, et al., 2019 d. ^[8]
Links between number of individual specie's crown volumes and elevation.	Liao, et al., 2019 e. ^[9]
Links between plant diversity and different disturbance of different elevation.	Liao, 2014 b. ^[10]
Links between dry weight biomass of biomedical plant and elevations.	Liao, 2020 a. ^[11]
Links between total biomass of fresh weight of medical plant and elevations.	Liao, 2020 b. ^[12]
Links between vegetation coverage of biomedical plant and elevation.	Liao, 2020 c. ^[13]
Links between pair's co-dominance abundance dominancy and elevation.	Liao, 2020 d. ^[14]
Relation between plant average height of biomedical plant and elevation.	Liao, 2020 e. ^[15]
Links between biomass of biomedical plant roots cuticle and elevation.	Liao, 2020 f. ^[16]
Links between biomass of medical plant roots cuticle and daily solar radiation.	Liao, 2020 g. ^[17]
Links between leafstalk biomass of biomedical plant and elevation.	Liao, 2020 h. ^[18]
Links between biomass of biomedical plant stems cuticle and elevation.	Liao, 2020 i. ^[19]
Links between Important Values of biomedical plant species and elevations	Liao, 2020 j. ^[20]
Links between moisture content of biomass of biomedical plant and elevation.	Liao, 2020 k. ^[21]

Typical Environmental Condition, Situation of Special Vegetation and Methods of Research.

Research typical area is local in three vegetation zones in China: firstly, evergreen vegetation in north subtropical zone; secondly, evergreen and deciduous coniferous and broad-leaved mixed forest in north subtropical and warm temperate transition; thirdly, deciduous vegetation in warm temperate zone by large total biomass of stems

cuticle investigation of medicinal plant. Thus, our research area is local in evergreen and deciduous coniferous and broad-leaved mixed forest in north subtropical and warm temperate transition (landscape types included: urban, rural settlement, wetland, forest, grassland, farmland, river landscape as well as mixed zone landscape interaction each other) along elevation and environmental gradient in *Mei County* of China (Figure 1).

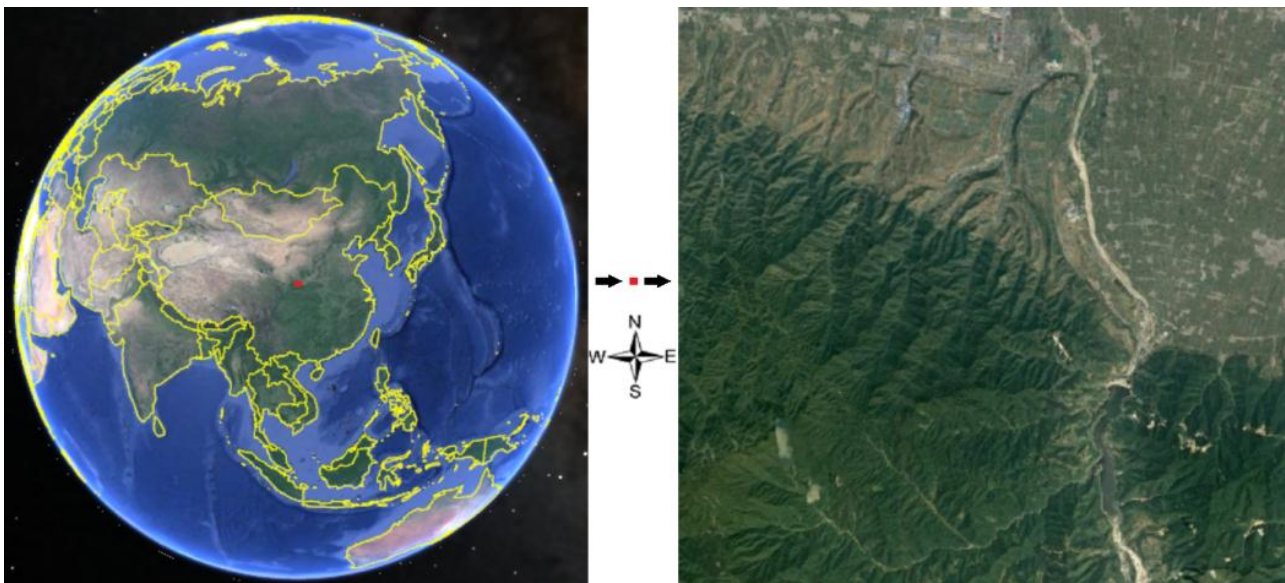


Figure 1: A Digital Cadaster Map and Location in *Mei County* of China of Earth.

There is a long time investigation by the links between medicinal plant species diversity and environments from

2005 to 2019. Investigation of “big data” included that dynamics of total biomass of stems cuticle of medicinal

plants or other index along environments (*Fu-niu Mountain, Yellow River, Ye County, Yi-luo River, Bai-gui Lake, Tai-bai Mountain, and Mei County, et al.*) by ecological cognitive ability along environmental gradient in hierarchical gradient over STEDS.^[2-21]

Thus, there is the links between total biomass of (*Smilax scobinicaulis*) stems cuticle and daily solar radiation, as well as there is a series of (good, better, best) green natural landscapes areas ecological adaptation of daily solar radiation of total biomass of (*Smilax scobinicaulis*) stems cuticle by the “big data” of the ecological investigation, qualitative analysis, quantitative statistics, human cognitive ecological linguistic rules, theories, methods and ways at STEDS.^[3-28]

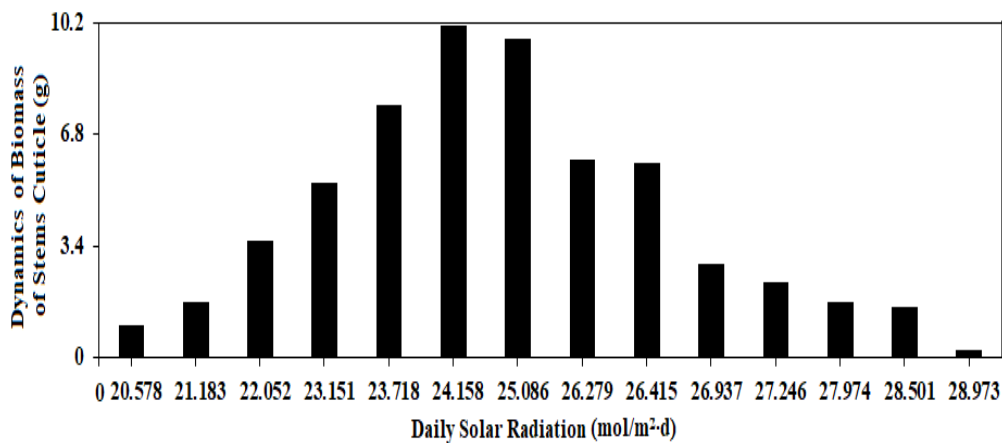


Figure 2: Dynamics of Biomass of Stems Cuticle along Daily Solar Radiation Gradient.

Firstly, this research proposed that not only there is the increasing of total biomass of stems cuticle of this plant species with the increasing daily solar radiation, as well as there is the significant positive correlation between total biomass of stems cuticle of this species and daily solar radiation from 20.578mol/m²·d to 24.158mol/m²·d ($P<0.01$) along elevation from 500m to 1500m, but also there is the decreasing of total biomass of stems cuticle of this plant species with the increasing of daily solar

RESULTS AND ANALYSIS

(*Smilax scobinicaulis*) not only is a vital medicinal material plant of treating joint pain, but also it is widely distributed wide plant species along elevation from 500 to 3100m in natural ecosystem along elevation from 500m to 3100m in *Mei County*. However, understanding daily solar radiation effect on the links between this total biomass of stems cuticle and daily solar radiation is very difficult. Using “big data” investigation, this research suggested there are three rules along increasing of daily solar radiation and elevation gradient in *Mei County* of China:

radiation, and there is the significant negative correlation between total biomass of stems cuticle of this species and daily solar radiation from 24.158mol/m²·d to 28.973mol/m²·d ($P<0.01$) along elevation from 1500m to 3100m. Because there is the increasing of daily solar radiation with increasing daily solar radiation and elevation is the significant positive correlation along elevation from 500m to 3100m ($P<0.01$) (Figure 2, 3; Table 2, 3).

Table 2: Correlation between total biomass of stems Cuticle and Daily solar Radiation.

Daily Solar Radiation along Elevation Gradient	Plant Biomass of Stems Cuticle
Daily Solar Radiation From 500m to 1500m	0.944**
Daily Solar Radiation From 150m to 3100m	-0.958**

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

Secondly, this research provided good areas ecological adaptation of daily solar radiation of this medical plant species is local in the areas ecological adaptation of daily solar radiation from 20.578mol/m²·d to 28.973mol/m²·d along elevation from 500m to 3100m, and not only there are better areas ecological adaptation of daily solar radiation of this species from 23.151mol/m²·d to 27.974mol/m²·d along elevation gradient from 1100m to 2700m, but also there are the best areas ecological adaptation of daily solar radiation of this medical plant species from 23.718mol/m²·d to 25.086mol/m²·d along

elevation from 1300m to 1700m at STEDS in *Mei County* (Figure 2,3).

Thirdly, this research suggested that medicinal plant (*Smilax scobinicaulis*) of treating joint pain is local in six natural landscape types (forest, mixed between grassland and forest, mixed between forest and wetland, mixed between forest and river, mixed between forest and urban, mixed between forest and rural settlement), because of there is result of dynamics of air and soil environments along elevation and environmental gradient at “big data” STEDS (Figure1).

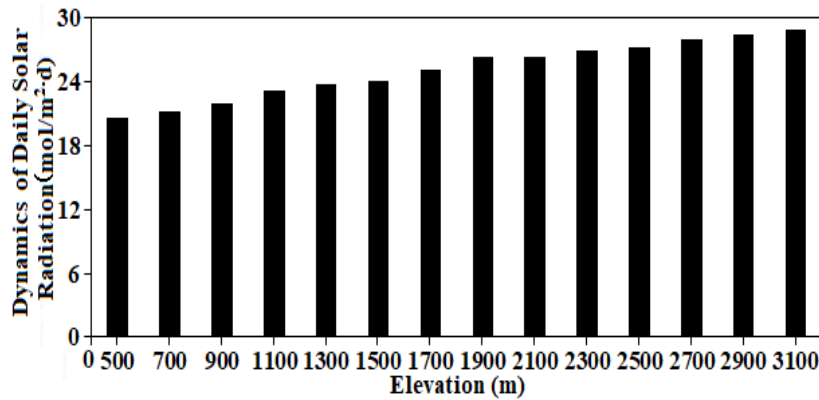


Figure 3: Dynamics of daily solar radiation along elevation gradient.

Thus, this research finds a series of typical (good, better, best) areas ecological adaptation of (*Smilax scobinicaulis*) of treating joint pain along elevation (daily

solar radiation), and there is links between total biomass of stems cuticle and daily solar radiation along elevation.

Table 3: Correlation between total biomass of stem cuticle daily solar radiation gradient.

Elevation (m)	Elevation Gradient from 500m to 3100m
Daily Solar Radiation	0.992**

Note: **, $P < 0.01$.

CONCLUSION AND DISCUSSION

Understanding the dynamics of total biomass of stems cuticle of medicinal species is very difficult.^[2-25] This research suggested three rules with biomass of stems cuticle of this species:

Firstly, there is the significant positive correlation between total biomass of stems cuticle of this species and daily solar radiation along elevation from 500m to 1500m ($P < 0.01$), because of there is increasing of total biomass of stems cuticle with increasing of daily solar radiation from 20.578mol/m²·d to 24.158mol/m²·d. Meanwhile, there is significant negative correlation between Total biomass of stems cuticle and daily solar radiation along elevation from along elevation from 1500m to 3100m ($P < 0.01$), because of there is decreasing of total biomass of stems cuticle with increasing of daily solar radiation from 24.158mol/m²·d to 27.246mol/m²·d ($P < 0.01$).

Secondly, this research provided good areas ecological adaptation along elevation from 500 to 3100m, the better areas ecological adaptation along elevation from 1100 to 2500m, and the best areas ecological adaptation of daily solar radiation of this medical plant along elevation from 1300 to 1700m is local in *Mei County* of China along environmental gradient at STEDS (Figure 2, 3).

Thirdly, this research suggested that total biomass of stems cuticle of this species of treating joint pain is local in six near-landscape types (forests, mixed landscapes between forestation and wetland, mixed landscapes between grassland and forestation, mixed landscapes between forest and urban, mixed landscapes between forest and river, mixed landscapes between forest and rural settlement) by “big data” and researches along air and soil environments (Figure1).

Therefore, this research has a vital theoretical and practical significance for the reasonable protection of total biomass of stems cuticle of this species along the daily solar radiation and elevation gradient in six natural landscapes. Because of this plant species not only is a vital widely distributed wide medicinal plant species of treating joint pain, but also there are three rules by the links between total biomass of stems cuticle of this species and daily solar radiation. In short, regional planners need regulation a lot of landscape sustainability based on researches on total biomass of stems cuticle of medical plant species (biodiversity, composition, structure, et al.) by the “big data” investigation, qualitative analysis, quantitative statistics, human cognitive ecological linguistic rules and theory of the links between biodiversity and environments in the global, local, regional landscapes for the better future of human health, as well as ecosystem stability, ecosystem functions, and ecosystem services along the different elevation, daily solar radiation and other environmental gradient at STEDS.^[1-21,26-43] Next work this finding is a basal knowledge for the better understanding the interrelations between environmental factors and multilevel diversity (e.g., landscapes, population, communities, and species level).^[44-48] Future human ecological cognitive linguistic theory^[49] must understand the different environmental factors influencing the multilevel species ecological traits (such as leaves, stem barks, roots,^[50] resources and genetic breeding,^[51] synthetic metabolism,^[52] biodiversity,^[53] adventitious roots,^[54] microbiome shift,^[55] anti-infective plants^[56]) for decrease ecosystem collapse and biodiversity loss^[57] by green chemical approach,^[58] phytochemistry and therapeutics methods,^[59] or other ways.

ACKNOWLEDGEMENT

This work was supported by A Grade of Key Disciplines of Environmental Science Foundation, B Grade of Key Disciplines of Mistrials 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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