WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 10, Issue 12, 2503-2514. Research Article ISSN 2277– 7105

LINKAGES BETWEEN BIOMASS OF (SMILAX SCOBINICAULIS) ROOTS CUTICLE AND DAILY SOLAR RADIATION

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Article Received on
21 August 2021,
Revised on 11 Sept. 2021,
Accepted on 01 October 2021
DOI: 10.20959/wjpr202112-22110

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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 roots cuticle and daily solar radiation is difficult. This study explained that it is an increasing of total biomass of roots cuticle with increasing of daily solar radiation as well as links between total biomass of roots cuticle and daily solar radiation is the significant positive connection from 20.578mol/m^2•d to 24.158mol/m^2•d along elevation from 500m to 1500m (P<0.01); it is a decreasing of this total biomass of roots cuticle with increasing of daily solar radiation as well as the linkages between this total biomass of roots cuticle and daily solar radiation is a significant negative connection from 24.15mol/m^2•d to 27.246mol/m^2•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 human health, ecosystem services and ecosystem functions along daily solar radiation over spatiotemporal scale.

KEYWORDS: Biomass of roots cuticle; daily solar radiation; links; medicinal; areas

ecological adaptation.

INTRODUCTION

More and more ecologists have predicted the links between total biomass of roots cuticle of the medical plants and environments along elevation from total biomass of plant roots cuticle (plant functional groups, biodiversity, height, total biomass of roots cuticle) of medicinal plant species perspective by biodiversity researches (Table 1)[1-11], which based on better future of human heath by the finding medicinal plants. However, traditional medicinal plant species with typical history spanning over 1500 years, as well as areas ecological adaptation of a lot of total biomass of roots cuticle of plant are unknown and values of medicinal species also cannot be utilized.[12-16]

(*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 belong to *Smilax L.* genus of Liliaceae families of Monocotyledoneae in Angiospermae. However, understanding the links between total biomass of roots cuticle of medical plants and dynamics of daily solar radiation along elevation gradient is unknown, and the links between total biomass of roots cuticle of plants, elevation and daily solar radiation is difficult finding at spatial-temporal-environmental-disturbance scale (STEDS).[1-17]

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

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

Table 1: Evaluation of linkages between dynamics of medicinal plants and environs.

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]

Therefore, there is not only the vital links between total biomass of roots 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 of ecosystem composition (services, functions, structures) and eco-health and human well-being over STEDS.

Typical Environmental condition, situation of special vegetation and methods of research

The study 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 roots cuticle investigation of medicinal plant. Thus, this 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).

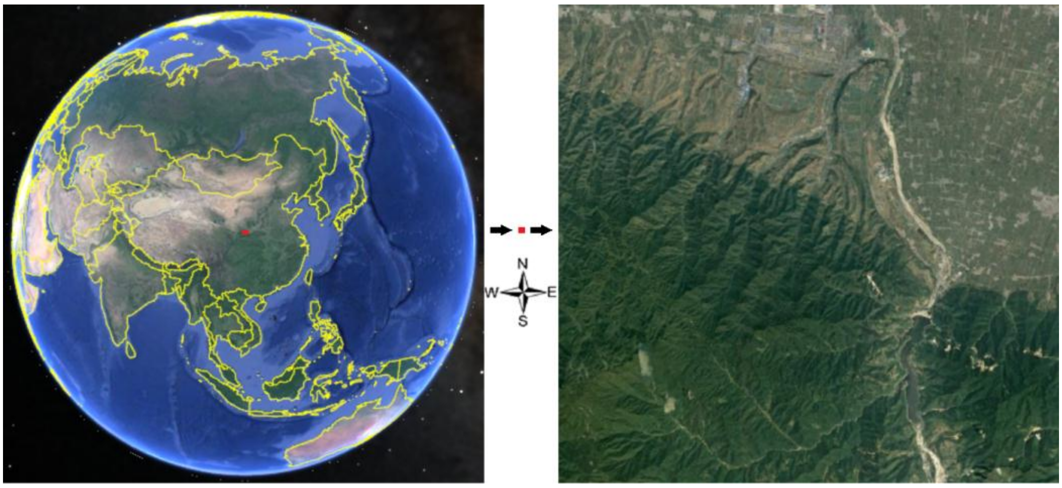

Figure 1: A Digital Cadaster Map and Location in *Mei County* of China of Earth.

There is a long time investigation by the links between medicinal plant species diversity and environments from 2005 to 2019. Investigation "big data" included that dynamics of total biomass of roots cuticle of medicinal plants or other index along environments (*Fu-niu Mountain*, *Yellow River*, *Ye County*, *Yi-luo River*, *Bai-gui Lake*, et al.) based on ecological cognitive ability.[2-21]

Thus, there is the links between total biomass of (*Smilax scobinicaulis*) roots cuticle and daily solar radiation as well as there is a series of (good, better, best) natural landscapes areas ecological adaptation of daily solar radiation of this medical plant species 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 over STEDS.[3-29]

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 the natural ecosystems along elevation from 500m to 3100m in *Mei County*. However, understanding daily solar radiation effect on the links between this total biomass of roots cuticle and daily solar radiation is difficult. Using "ecological big data" investigation, based on quantitative statistics and qualitative analysis, herein suggested there are three rules along increasing of daily solar radiation and elevation gradient at STEDS in the typical landscape areas of *Mei County* of China:

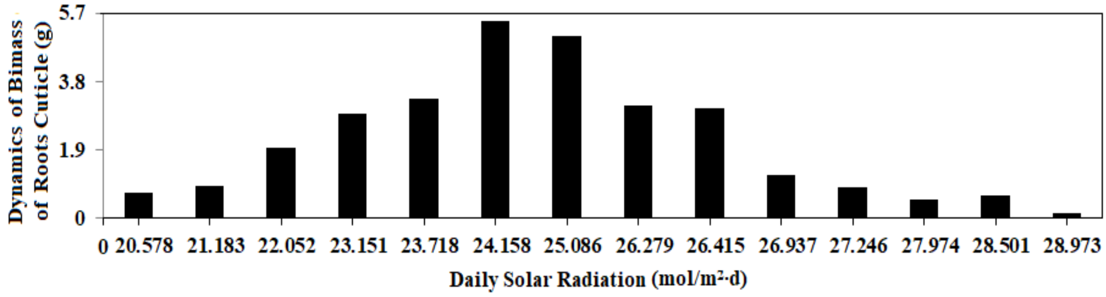

Figure 2: Dynamics of Biomass of Roots Cuticle along Daily Solar Radiation Gradient.

Firstly, this research proposed that not only there is the increasing of total biomass of roots cuticle of this plant species with the increasing daily solar radiation, and there is the significant positive connection between total biomass of roots cuticle of this species and daily solar radiation from 20.578mol/m^2•d to 24.158mol/m^2•d (P<0.01) along elevation from 500m to 1500m, but also there is the decreasing of total biomass of roots cuticle of this plant species with the increasing of daily solar radiation, as well as there is the significant negative connection between total biomass of roots cuticle of this plant species and daily solar radiation from 24.158mol/m^2•d to 28.973mol/m^2•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 connection along elevation from 500m to 3100m (P<0.01) (Figure 2, 3; Table 2, 3).

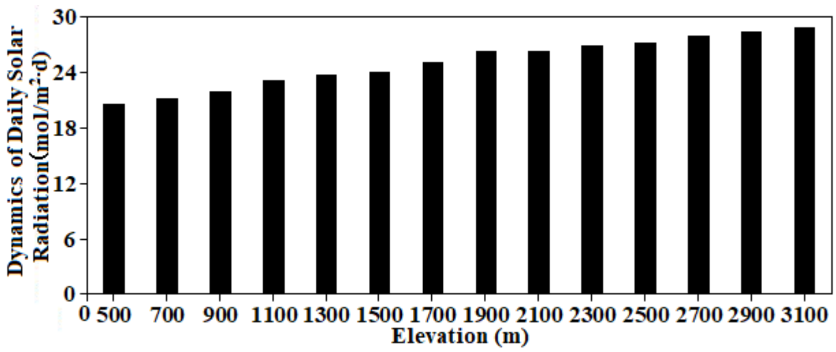

Figure 3: Dynamics of Daily Solar Radiation along Elevation Gradient.

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/m^2•d to 28.973mol/m^2•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/m^2•d to 27.974mol/m^2•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/m^2•d to 25.086mol/m^2•d along elevation from 1300m to 1700m at STEDS in *Mei County* (Figure 2,3).

Table 2: Connection between Total Biomass of Roots cuticle and Daily Solar Radiation.

Daily Solar Radiation along Elevation Gradient	Plant Biomass of Roots 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.

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 by "big data" over STEDS (Figure1).

Table 3: Connection between Biomass of Roots Cuticles and Daily Solar Radiation Gradient.

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

Note: **, P<0.01.

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 roots cuticle and daily solar radiation along elevation.

CONCLUSION AND DISCUSSION

Understanding the dynamics of total biomass of roots cuticle of medicinal species is very difficult.[16,17] Herein suggested three rules with biomass of roots cuticle of (*Smilax scobinicaulis*):

Firstly, there is the significant positive connection between total biomass of roots 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 roots cuticle with increasing of daily solar radiation from 20.578mol/m^2•d to 24.158mol/m^2•d. Meanwhile, there is significant negative connection between Total biomass of roots 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 roots cuticle with increasing of daily solar radiation from 24.158mol/m^2•d to 27.246mol/m^2•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 roots 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 Figure 2, 3).

Therefore, herein has a vital theoretical and practical significance for the reasonable protection of total biomass of roots 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 roots 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 roots cuticle of medical plant species (biodiversity, composition, structure, et al.) by the "eco-big data" investigation, qualitative analysis, quantitative statistics and 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 and ecosystem stability (functions, structures, services) along elevation or daily solar radiation.[16-25,26-49] 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], phytochemistrym 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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