



(RESEARCH ARTICLE)



## Relation between fresh biomass of plant species (*Senecio L.*) and elevation in Shan County

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### Abstract

A key plant species (*Senecio L.*) not only is a vital multilevel functional medicinal material of indications of respiratory tract infections, tonsillitis, pharyngitis, pneumonia, conjunctivitis, enteritis, dysentery, but also it is a widely distributed wide plant species. This plant species is widely distributed elevation from 500m to 1500m in six landscapes and vegetation ecosystems in *Shan County* of China. However, understanding dynamics of dry biomass of this species is difficult along elevation. This research explained that the relation between fresh biomass of the species and elevation is a significant positive connection from 500m to 1000m ( $P < 0.01$ ) as well as the links between fresh biomass of this species and elevation is a significant negative connection from 1000m to 1500m ( $P < 0.01$ ). This study provides six ecosystem types and a series of areas ecological adaptation for finding new medicinal species. Therefore, this study has vital theoretical and practical significance for medicinal plant protection along different elevation and environmental gradient over the spatial-temporal-environmental-disturbance scales (STEDS) in the multilevel green space diversity.

**Keywords:** Fresh biomass; Elevation; Connection; Areas ecological adaptation; Plant medicinal species

### 1. Introduction

Natural environmental and plantation factors often integrated effects of the human activities and acid rain on medicinal plant species by the research of process for deposition of thin films<sup>1-3</sup>. But medicinal plant functional more traits may be finding through key physiological characters of antireflection coatings and ecological functional traits along elevation gradient<sup>4-7</sup>. Using plant leaf oxide films technological tools<sup>8-10</sup>, scientists explain that multilevel functional traits of medical species<sup>11, 12</sup> and medical plant communities<sup>13, 14</sup> by dynamic framework model<sup>15</sup> for food chains<sup>16</sup>.

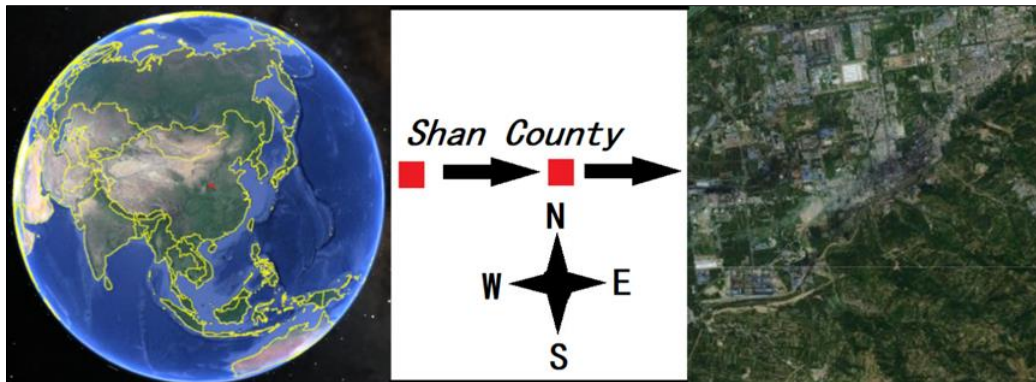
For instance, dynamics of community's height<sup>17</sup>, tree community's total trunk volume<sup>18</sup>, plant community's tree individual number<sup>19</sup>, plant individual specie's and plant communities' crown volume<sup>20, 21</sup> of medicinal plant (*Sophora japonica*) along elevation. Although limits to local agricultural landscape area for protecting more natural landscapes<sup>22</sup> (e.g., grasslands, wetlands, water and forests) or some half natural landscapes (e.g., green ecological urban and beautiful green countryside) areas for sustainable medical plant species, but dynamics of total dry biomass<sup>23</sup>, total fresh biomass<sup>24</sup>, vegetation coverage<sup>25</sup>, plant average height<sup>26</sup>, roots cuticle biomass<sup>27</sup>, leaf -stalk biomass<sup>28</sup>, stems cuticle biomass<sup>29</sup>, species pair's co-dominance abundance dominance<sup>30</sup>, Important Value<sup>31</sup> and moisture content<sup>32</sup> of (*Cremastra Appendiculata*) also deeply research.

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Therefore, it is a vital topic issues that the relationship between gene level and medical plant roots cuticle functional traits<sup>33,34</sup>, as well as the dynamics of roots cuticle biomass<sup>35</sup>, fresh roots biomass<sup>36</sup>, stems cuticle biomass<sup>37</sup> associations with daily solar radiation for human cognitive<sup>38</sup> medical plant<sup>39</sup>, especially, risk assessment and early warning mechanism (e.g, watersheds areas)<sup>40,41</sup>. In short, herein explains that relation between fresh biomass of this plant and elevation.

## 2. Typical environmental condition, situation of typical vegetation and methods of research

Study area is local in three typical 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, this area is local in evergreen and deciduous coniferous and broad-leaved mixed forest in north subtropical and warm temperate transition in *Shan County* of China at STEDS (Figure 1).



**Figure 1** A Digital Cadaster Map of Typical Location in *Shan County* of China on Earth

There are long-time investigation of connections among dry biomass of medicinal plant species and elevation from 2005 to 2019. Investigation of “big data” included that dry biomass of medicinal plant species or other ecological index of medicinal plant species along the different elevation and environmental gradient by the previous key research over STEDS<sup>42, 43</sup>.

Thus, there is relation between fresh biomass of (*Senecio L.*) and elevation, as well as there is a series of best six landscapes areas ecological adaptation of dry biomass of this plant species by the “big data” of the ecological investigation, qualitative analysis, and quantitative statistics, human cognitive ecological linguistic rules, scientific theories and ecological planning methods.

## 3. Results and discussion

Based on “big data” of plant investigation, this species is a widely distributed wide species along elevation from 500m to 1500m. A key species (*Senecio L.*) is a widely distributed along the different elevation from 500m to 1500m in *Shan County* of China. However, understanding the elevation effect on the relation between fresh biomass of this plant species and elevation is very difficult, because elevation effect on plant root biomass<sup>43</sup>, bryophyte and lichen biomass<sup>44</sup>, wood biomass<sup>45</sup>, mushroom biomass and diversity biomass<sup>46</sup>, production of medicinal plant species<sup>47</sup>.

Using the dynamics of “big data” investigation, this work suggested there are five rules:

Firstly, herein showed that it is not only the increasing of fresh biomass of (*Senecio L.*) with the increasing of elevation from 500m to 1000m, as well as there are but also decreasing of fresh biomass of (*Senecio L.*) with increasing of elevation from 1000m to 1500m (Figure 3).

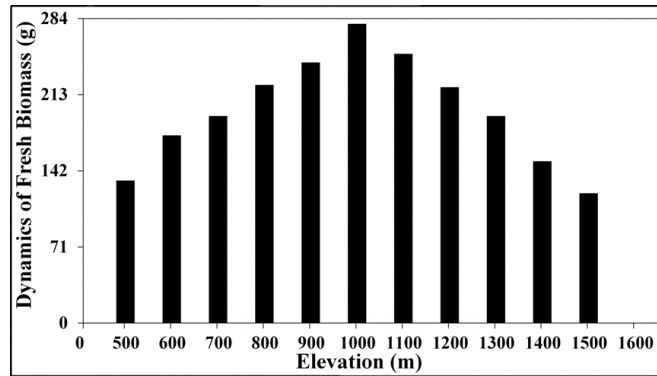
Secondly, this study explained that there is the significant positive connection between fresh biomass of (*Senecio L.*) and elevation from 500m to 1000m ( $P < 0.01$ ), as well as there is the significant negative connection between fresh biomass of (*Senecio L.*) and elevation from 1000m to 1500m in *Shan County* of *Henan Province* of China at spatiotemporal scale ( $P < 0.01$ ) (Table 2).

Thirdly, this research shows a good areas ecological adaptation of (*Senecio L.*) from 500m to 1500 in *Shan County* of China. Because there are results that there are not only dynamics of different air environmental factors, there are but also dynamics of different environmental factors from 500m to 1500m by the dynamics of fresh biomass of this medical species (Figure 1, 2).

**Table 1** Fresh Biomass of this Medical Plant Species Association with Elevation Gradient

Fresh Biomass along Elevation	Fresh Biomass of This Medical Plant Species
Elevation From 500 to 1000	0.994**
Elevation From 1000 to 1500	-0.998**

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



**Figure 2** Dynamics of Fresh Biomass of (*Senecio L.*) along Elevation Gradient

Fourthly, this research proposed that the medicinal plant species (*Senecio L.*) is local in the six typical ecosystem types (forests ecosystem, mixed ecosystem between forestation and grassland, mixed ecosystem between forests and wetland, mixed ecosystem between forests and river, mixed ecosystem between forests and eco-urban, mixed ecosystem between forests and rural settlement) by the “big data” of fresh biomass of medicinal plant species 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 1500m along elevation gradient.



**Figure 3** Total Structures of Medical Plant Species (*Senecio L.*) by Long-time Investigation

Fifthly, the typical medical plant species (*Senecio L.*) not only is a vital functional medicinal material of indications of treating to respiratory tract infections, tonsillitis, pharyngitis, pneumonia, conjunctivitis, dysentery and enteritis, but also it is belonging to *Compositae* families of *Senecio* races of *Discotyledoneae* in *Angiospermae*, especially, total structures of (*Senecio L.*) (Figure 3).

Thus, this research found a series of typical areas ecological adaptation of plant (*Senecio L.*) of indication of treating respiratory tract infections, tonsillitis, pharyngitis, pneumonia, conjunctivitis, enteritis, dysentery along elevation gradient, as well as there is a relation between fresh biomass of this typical medical plant species (*Senecio L.*) and elevation gradient in *Shan County* of China.

#### 4. Discussion

The respiratory tract infections, tonsillitis, pharyngitis, pneumonia, conjunctivitis, dysentery and enteritis always influence public health, which often led human died. But understanding dynamics of medicinal plant species is very difficult issues, for instance, molecular dynamics<sup>48</sup>, evolutionary dynamics<sup>49</sup> and indigenous medical plant<sup>50</sup>. So, finding a vital multilevel functional medicinal plant (*Senecio L.*) of indications of respiratory tract infections, tonsillitis, pharyngitis, pneumonia, conjunctivitis, enteritis and dysentery not only is a key value plant species, but also treating many people's diseases or saving some individual human-lived. As such, it is a research that (*Senecio L.*) were found from 500m to 1500m in *Shan County of Henan Province* of China. And this research suggested three rules between fresh biomass of (*Senecio L.*) and elevation gradient over STEDS:

- This work showed that there is an increasing of fresh biomass of (*Senecio L.*) with enhancing of elevation from 500m to 1000m, as well as there is decreasing of fresh biomass of (*Senecio L.*) with increasing of elevation from 1000m to 1500m (Figure 2). There is the significant positive connection between fresh biomass of (*Senecio L.*) and elevation from 500m to 1000m ( $P<0.01$ ) as well as there is the significant negative connection between fresh biomass of (*Senecio L.*) and elevation from 1000m to 1500m along elevation gradient in *Shan County* ( $P<0.01$ ) (Table 1).
- This research provides six lands types (forests vegetation, mixed vegetation between forests and grassland, mixed vegetation between forests and wetland, mixed vegetation between forests and river, mixed vegetation between forest and eco-urban, mixed vegetation between forests and green beatified countryside), as well as there is a series of eco-adaptation of landscape areas (for instance, the best areas ecological adaptation of (*Senecio L.*) from 500m to 1500m ) for finding this plant (*Senecio L.*) by dynamics of fresh biomass (*Senecio L.*) along elevation gradient.
- (*Senecio L.*) not only is a vital multilevel functional medicinal material of indications of treating to respiratory tract infections, tonsillitis, pharyngitis, pneumonia, conjunctivitis, dysentery and enteritis, but also it is belonging to *Compositae* families of *Senecio* races of *Discotyledoneae* in *Angiospermae*, as well as it is widely distributed wide specie by the "big data" investigation of fresh biomass of (*Smilax scobinicaulis*) in *Shan County of Henan Province* (Figure 1, 2, 3).

Indeed, better regional regulators and local government need better planning and regulation many medicinal plant species sustainability<sup>51</sup> of ecosystems by researches on the vital biomass of medicinal plants<sup>52</sup> along elevation and environments with dynamics of plant diversity in the global, regional and landscapes natural ecosystem types with the ways "big data" investigation, scientific quantitative statistics<sup>53</sup> by landscape stability and sustainable medical plant diversity production<sup>54</sup>.

#### 5. Conclusion

This research has a vital theoretical and practical significance for the reasonable protection of (*Senecio L.*) along elevation gradient, because this plant species not only is an important widely distributed wide medicinal material pant by treating infections, tonsillitis, pharyngitis, pneumonia, conjunctivitis, enteritis, dysentery, but also there are five rules by relation between fresh biomass of (*Senecio L.*) and elevation. Government planner will protects landscape habitats of this medical plant species (*Senecio L.*) by new eco-restoration of multilevel diversity technology<sup>55</sup> in the future.

#### Compliance with ethical standards

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