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Research on eco-restoration of damaged Agro-ecosystem by new biodiversity technology

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Abstract

Henan Province is a typical key area of Chinese main agricultural and food planting. However, a key eco-restoration of degraded farmlands issue needs be resolved by biodiversity technology. Because sustainable agro-ecosystem quickly growth must inject new technology, just as nitrogen-fixing plants can replace the using of chemical nitrogen fertilizers, insect repellent plants can replace the use of chemical insecticides, (*Robinia pseudoacacia L.*) wood populations surrounding the damaged agricultural ecosystem can block wind impacting on the death of wheat, "plants of soil and water conservation" can avoid the loss of water and nutrients around farmland in low mountain and hilly areas in typical key area of *Henan Province* of Chinese. This work firstly has been resolved eco-restoration of damaged agro-ecosystem by biodiversity technology.

Keywords: Ecological restoration; Damaged agro-ecosystem; Plant diversity; Technology; Linkage

1. Introduction

Many scientists have predicted the interrelation between plant composition (structure, biomass) diversity and environs. For instance, Liao et al. shows that interrelations between plant groups and elevation[1], herb diversity and elevation[2], plant functional composition diversity and hill altitude[3], elevation and plant functional diversity[4], tree number and altitude[5], elevation and tree height[6], the tree trunk volume and elevation[7], the tree community crown volume and elevation[8], individual specie's crown volumes and elevation[9], disturbance gradient and plant diversity [10], plant dry weight biomass and elevation[11], plant fresh weight biomass and elevation[12], plant vegetation coverage and elevation[13], the plant pair's co-dominance abundance dominancy and elevation[14], biomedical plant average height diversity and altitude[15], plant species biomass and elevation[16-19], Important Values of biomedical plant species diversity and altitude[20], diversity moisture content of plant biomass and elevation[21], plant diversity and environs[22], disturbance environmental factors to plant diversity[23], climatic environs and plant community's diversity[24], plant communities and spatial-temporal scale[25], the plant food chains of fragmented landscapes and environs[26] (Table 1) over spatiotemporal-environ-disturbance scales (STEDS) in the typical landscape areas of China.

However, it is an unknown of degraded farmlands eco-restoration issue by plant species diversity technology. This is because differences plant species improve agro-landscape ecosystem health, For example, nitrogen-fixing plant species, insect repellent plant species, plant species of soil and water conservation and wood plant populations have different ecological functions in damaged farmlands landscape areas. Evermore, degraded farmlands inter-influence with different plants.

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Therefore, this work will explain the interrelations between different plant species numbers and abiotic functions (nitrogen fertilizers, insect repellent, soil and water conservation, block winds). These key interrelations will improve degraded agricultural landscape for better health function. So, herein firstly has resolved eco-restoration by plant species diversity technology over STEDS.

Table 1 Evaluation of links between dynamics of plant diversity and environmental factors

Assessments of links between multilevel medicinal plant and elevation	Authors
Links between biodiversity of plant functional groups and elevation..	Liao, et al., 2010 [1].
Links between biomass of herb diversity and elevation in wetland landscape.	Liao, et al., 2011 a [2].
Links between plant functional composition diversity and elevation in forest.	Liao, et al., 2011 b [3].
Links between plant functional diversity and elevation in near-natural forests.	Liao, et al., 2014 a [4].
Linkage between tree species number and elevation in natural forests.	Liao, et al., 2019 a [5].
Linkage between tree height diversity and elevation in forest ecosystems.	Liao, et al., 2019 b [6].
Links between tree trunk volume diversity and elevation in forest lands.	Liao, et al., 2019 c [7].
Linkage between tree community crown volume diversity and elevation.	Liao, et al., 2019 d [8].
Links between individual specie's crown volumes diversity and elevation.	Liao, et al., 2019 e [9]
Links between plant diversity and different disturbance along elevation.	Liao, 2014 b [10].
Linkage between plant dry weight biomass diversity and elevation.	Liao, 2020 a [11].
Linkage between plant total fresh weight biomass diversity and elevation.	Liao, 2020 b [12].
Linkage between plant vegetation coverage diversity and elevation.	Liao, 2020 c [13].
Links of plant 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].
Linkage 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].
Linkage between leafstalk biomass of biomedical plant and elevation.	Liao, 2020 h [18].
Linkage between biomass of biomedical plant stems cuticle and elevation.	Liao, 2020 i [19].
Links between Important Values of biomedical plant species and elevation.	Liao, 2020 j [20].
Linkages between diversity moisture content of plant biomass and elevation.	Liao, 2020 k [21].
Interrelations between plant diversity and environs in agro-ecosystem.	Liao, 2019 f [22].
Interlinking disturbance environmental factors to plant species diversity.	Liao, et al., 2015[a23].
Inter-connections between plant community's diversity and climatic environs.	Liao, et al., 2015[b24].
Interrelations between plant communities and spatial environmental factors.	Liao, et al., 2015[c25].
Interlinks among plant food chains of fragmented landscapes and environs.	Liao, et al., 2016[26].

1.1 Environmental Condition, Situation of Typical Vegetation and Methods of Research

Key agroecosystems is a result of the historical natural and anthropogenic activities in *He-nan Province* of *China*. It is local areas mostly in mountain (2432m) and low (32m) with a height different of more than 2400 m above sea level (Figure 1; Table 2). Three fields of plant diversity of investigations were conducted in 2017 to 2019, investigating plant diversity, which is ideal for studying distribution and features of plant species diversity in farmlands "big data" (Figure 1).

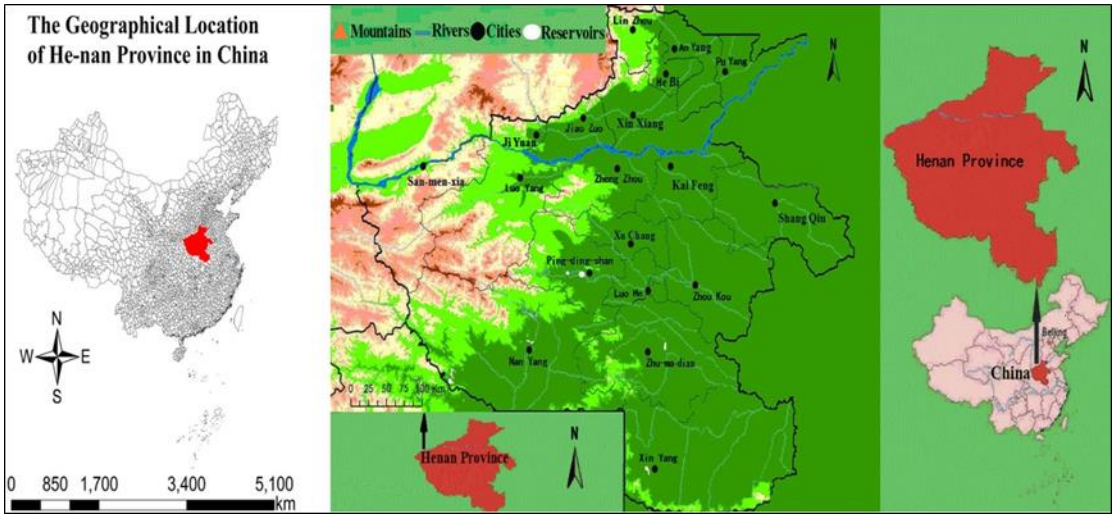

Figure 1 A Key Digital Cadastre Map of Typical Location Area of *He-nan Province* in China

Table 2 The physical geographic conditions and vegetation in *Henan Province* of China

Location	**Climatically Condition**							**Elevation (m) †**	**Area 10^3km^2**	**A Typical Areas of Vegetation**
Latitude (º): 31.38 -36.37	Precipitation (mm)	Mean Temperature (ºC)						32-2432	167	Straddling mixed plant zones of the warm-temperate and subtropical zones of typical areas of China.
	510-1120	**Annual**		**Maximum**		**Minimum**				
Longitude (º): 111.35 -116.65		South	North	South	North	South	North			
		11 -27	12 -19	12 -37	15 -39	-10 -21	-8 -19			

2. Results Based on Quantitative Statistics and Qualitative Analysis and Discussion

Sustainable green and ecological agro-ecosystem growth must injecting new technology. Just as: nitrogen-fixing plants can replace the using of chemical nitrogen fertilizers, insect repellent plants can replace the use of chemical insecticides, wood populations surrounding the damaged agricultural ecosystem can block wind impacting on the death of wheat, "plants of soil and water conservation" can avoid the loss of water and nutrients around farmlands, which is a possibly new green and ecological technology. In short, new green and ecological technology often improves the heath advancement of agro-ecosystem in the local typical areas of farmlands landscape types.

Herein shows four vital relations: firstly, (*Medicago falcata L.*) biomass significant positive connection with Nitrogen-fixing; secondly, (*Imperata cylindrica L.*) biomass significant positive connection with water content; thirdly, (*Daphne genkwa*) biomass significant positive connection with number of insects' death; fourthly, (*Robinia pseudoacacia L.*) biomass significant positive connection with block wind level (P<0.05; P<0.01) (Figure 2, Table 3). Moreover, four regression equations are proved four relations, which is new green and ecological technology in heath growth of farmlands (Figure 2, Table 3). In short, new useful indigenous plant species (just as four plants: *Medicago falcata L.*, *Imperata cylindrica L.*, *Daphne genkwa*, *Robinia pseudoacacia L.*) is quickly improve human well-being, agro-ecosystems stability and health in *Henan Province* of China.

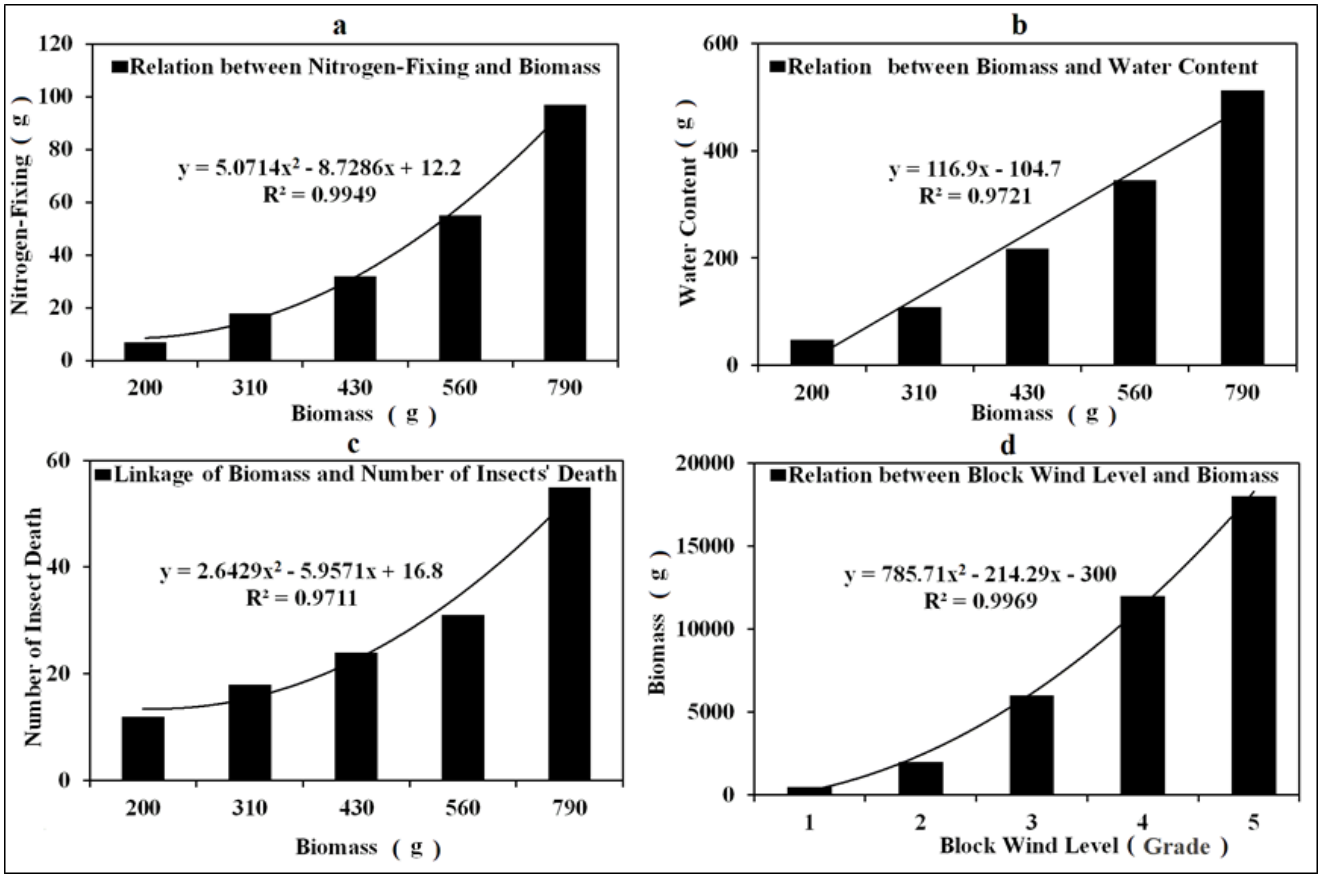

Figure 2 New green and ecological technology based on understanding key different relation (a) Relation of Nitrogen-fixing and (*Medicago falcata L.*) biomass; (b) Relation of water content and (*Imperata cylindrica L.*) biomass; (c) Linkage of (Daphne genkwa) biomass and number of insects death; (d) Relation between block wind level and (*Robinia pseudoacacia L.*) biomass

Table 3 Different plant species biomass significant positive connection with new index

Differ Plant Biomass	Nitrogen-fixing	Water content	Number of insects' death	Block wind level
(Medicago falcata L.)	0.992**	/	/	/
(Imperata cylindrica L.)	/	0.997**	/	/
(Daphne genkwa)	/	/	0.982**	/
(Robinia pseudoacacia L.)	/	/	/	0.978**

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

New indigenous plant species often were used new eco-technological innovation methods[27]. These compositions of ecologists and government planners also have been investigated and deeply researched. Indigenous plant species diversity is a very complex scientific issue[28]; however, useful indigenous plant species is very difficult finding[29]. So, resolving this question of eco-restoration of degraded agro-ecosystem will be new eco-restoration of plant diversity[30]. And this eco-technology also needs finding key relation between the key functions of differ sustainable plant species[31] and agro-ecosystem stability in the landscape functions[32], just as some nitrogen-fixing plant species will replace chemical nitrogen fertilizers, some plant species of insect repellent may be replace chemical insecticides, plant species of soil and water conservation must avoid the loss of water (soil), wood population can block wind levels impacting on the death of wheat (Figure 2, Table 3). In summary, new green and ecological technology not only cans promote advancement (growth)[33] of ecological restoration methods of degraded farmlands, but also cans increase sustainable plant species and agro-ecosystems stability by new plant diversity technology and ecological index[34-37].

3. Conclusion

Henan Province is a key area of Chinese main agricultural farmlands and human food planting. But ecological restoration of degraded farmlands issue needs be resolved by plants technology. Because sustainable agro-ecosystem advancement inject new technology: nitrogen-fixing plants (*Medicago falcata L.*) can replace agricultural growth history of using of chemical nitrogen fertilizers, insect repellent plants (*Daphne genkwa*) can replace agricultural growth history of use of chemical insecticides, (*Robinia pseudoacacia L.*) wood populations surrounding the damaged agricultural ecosystem can block winds impacting on the death of wheat, "plants of soil and water conservation" (*Imperata cylindrica L.*) can avoid the loss of water. Therefore, this paper firstly has been resolved eco-restoration of damaged farmlands by key new eco-technology of plant diversity.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest.

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