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Effects of the invasive purslane on plants and soils

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Abstract

Eupatorium adenophorum is one of the most serious invasive plants in China, causing serious harm to agriculture, forestry, animal husbandry and ecological environment. The impact of Eupatorium adenophorum on the plants in the invasion site is considerable, and analyzing the reasons for the successful invasion of Eupatorium adenophorum from the perspective of its impact on the plants themselves and the soil environment on which the plants depend for survival is conducive to finding a breakthrough in controlling the invasion of Eupatorium adenophorum. This paper summarizes and looks forward to the effects of Ziziphus ziziphi on plants and soil and its influence mechanism, with a view to providing assistance for the control of Ziziphus ziziphi and the protection of invaded places.

Keywords

Amaryllis; Plant; Soil nutrients; Enzyme activity; Soil microorganisms.

1. Introduction

Invasive alien organisms cause serious interference and harm to the structure, function and ecological environment of the ecosystems in the invaded places, and become an important component of global change [1]. China is one of the countries most seriously affected by the invasion of exotic organisms, and the annual economic loss caused by only 11 major harmful invasive organisms is as high as 57.43 billion RMB [2]. Evaluating the impacts of alien plant invasions on biodiversity and ecosystem functions in their invasion sites is one of the hotspots in invasion ecology research [3]. After arriving at new environments, invasive alien plants proliferate and spread in large numbers under suitable environmental conditions, and cause great impacts on the structure and function of local ecosystems through various pathways, with more far-reaching impacts on the underground parts of ecosystems [4-6].

Eupatorium adenophorum (Eupatorium adenophorum) is a worldwide pernicious invasive weed, for the Asteraceae (Compositae) perennial tufted semi-shrubby herbaceous plants, native to the Americas from Mexico to Costa Rica, and then introduced as an ornamental plant to Europe, and then introduced to Australia and Asia, and has been widely distributed in the tropics, subtropics, and over 30 It has been widely distributed in more than 30 countries in tropical and subtropical regions [7]. About the 1940s from the Sino-Burma border into our country after Yunnan, has spread spread to Guangxi, Sichuan, Guizhou, Chongqing and other places, to about 20 km per year speed with the southwest wind and spread northward spread, has been identified by China's General Administration of Environmental Protection as one of the most important 16 kinds of invasive alien organisms [8]. Studies have shown that Zea mays has chemosensory properties that can cause multiple hazards to plants, such as inhibiting seed germination and seedling growth [9], reducing crop yield [10], delaying flowering [11], causing changes in enzyme activity and deplanation structure [12], and causing dysregulation of physiological and chemical indicators of hormone levels [13]. All of these are related to the living environment of Zea mays [14], chemosensory substances [15-17] and their release mode [18], and the effect of chemosensory action shows differences depending on the plant [19].

A large number of experiments have shown that the invasion of exotic plants can change the ecological environment of the invaded site, and it is believed that invasive plants change the structure of the inter-root microbial community [20-22], and it is believed that this change is related to its invasive power [23-24]. The phenomenon of causing ecological changes in soil is thought to occur in two ways, one way is that the decomposition process of invasive plants' chemosensory substances, apoplastic matter, above-ground leachate, and root secretions directly provide soluble carbon, nitrogen, and other nutrients to the soil [25-26], and the other is that soil physical, chemical, and biological traits are altered by influencing the number and activity of soil microorganisms.Duda et al [27] showed that with the invasion of the quinoa plant saltbush (Halogeton glomeratus), the soil ecosystem of the invaded site was significantly altered, especially increasing the content of NO3-, P, K, and Na. Paul et al [28] investigated the effect of the invasion of spotted cornflower (Centaurea maculosa) on the soil C and N pools.

The impacts of Centaurea maculosa on the plants in the invasion site are many, and analyzing the reasons for the successful invasion of Centaurea maculosa from the perspective of its impacts on the plants themselves and on the soil environment on which the plants depend for their survival is conducive to finding breakthroughs in controlling the invasion of Centaurea maculosa. At present, there are a lot of studies on Zingiber officinale at home and abroad, so this paper summarizes and looks forward to the impacts and mechanisms of Zingiber officinale on plants and soils, which is expected to be helpful for further research.

2. Effects of the invasive purple stemmed zephyr on soils and their mechanisms

Exotic plant invasions can increase or decrease the fertility level of the soil at the invaded site. Soil analyses of mixed forests in the western mountains of Yunnan showed that heavy invasion significantly increased soil total P and nitrate nitrogen content, but significantly decreased total nitrogen and soil organic matter content. Increased soil nutrients usually favor plant growth competition , and it is possible that the first step of a successful invasion by an exotic plant may improve its competitive ability by altering its inter-root soil nutrients. The effect of the alien invasive plant Zelandra chinensis on the inter-root soil fertility of the invaded site was analyzed, and it was found that the soil fertility of heavily invaded soils was significantly higher than that of other soil zones, except for total phosphorus and potassium.Xiao et al. found that the invasion of Zelandra chinensis resulted in an increase in the content of total nitrogen and NO3- -N in the soil after the invasion of Zelandra chinensis, which was favorable for Zelandra chinensis to compete with the native plant competition. Some studies have attributed this phenomenon to the fact that apoplasts and root secretions promote the growth of microorganisms associated with the N cycle, such as ammonia-oxidizing bacteria, which in turn promotes the enhancement of N. AOB contribute even more in the nitrification process. Increased population of ammonia oxidizing bacteria (AOB) in the soil promotes nitrification. Plants all have the ability to improve effective soil nutrients. The effective nutrients of the soil of the invaded site of purple stem zephyr were higher than that of the native plant soil, especially higher than that of the mixed native plant area, whereas the effective nutrient content of the soil of the invaded site of purple stem zephyr increased with the degree of invasion, and at the same time, the single native plant

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area was higher than that of the mixed native plant area . It indicates that the ability of single aggregated growing plants to improve the soil is better than mixed growing plant zone, and any kind of plant is biased to form micro-ecological environment that is favorable to itself. The invasion of Zelandra chinensis, on the other hand, demonstrated a stronger ability to improve effective soil nutrients than native plants, which implies a mechanism for the expansion of Zelandra chinensis invasion, i.e., rapid and efficient access to nutrients to compete with native plants for competing resources by stronger improvement of nutrient levels in soil, especially poor soil.

Soil pH increased after the invasion of Phragmites australis . Experiments found that root secretions were not responsible for the increase in soil pH .Wang et al hypothesized that it was due to apoplastic decomposition and N sources that led to the increase in soil pH. Long-term preference for ammonium N usually leads to soil acidification, whereas long-term preference for nitrate N can alkalize the soil . Changes in soil p H values are a complex process involving many factors such as vegetation, environmental and climatic factors. It is not clear what causes the increase in pH. Higher soil pH under the purple stem zephyr community favors the action of soil enzymes, which facilitates nutrient uptake by plants and the conservation and accumulation of soil nutrients . Moreover, the increase in AOB abundance after soil pH elevation favors nitrification and increases soil N nutrients .

3. Research Outlook

In recent years, the harm brought by Zelandra chinensis to agriculture and animal husbandry and even human life has aroused enough alertness and attention, and the research on its chemosensory substances is more but single, mostly extracting the extracts through Petri dishes or pots to study the seed germination and seedling growth reflected laterally; in addition, the indoor cultivation test of the extracts of Zelandra chinensis had an effect, but it was difficult to verify it in the field test. It was found that soil organisms can degrade the chemosensory substances of Zea mays by sand cultivation test, thus attenuating or even eliminating the chemosensory effect. Therefore, further research is needed on the quantitative aspects of chemosensory substances and their degradation and influence mechanisms, and it is necessary to provide more realistic natural conditions for the experiment or to study Zelandra chinensis under natural conditions. Zelandra chinensis can cause changes in the structure of microbial communities, but how it affects them is still unclear, and it is necessary to increase the breadth and depth of research on the relationship between sensing substances and soil microbial communities. As for the relationship between A. purpurea and forest trees, field surveys are the main focus, and there is a lack of research on the mechanism of A. purpurea's impact on forest trees. Ectomycorrhizal fungi are important components of forest ecosystems, and there are few reports on the relationship between A. purpurea and them. By deepening the research in these aspects, we will explore the intrinsic law of the invasion of Zelandra, elucidate the action mechanism of chemosensory substances, and conduct comprehensive research from multiple perspectives, so as to open up new ways for the prevention and control of Zelandra and the protection of invaded areas.

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