

Phytoremediation: Green Weapon to Fight Pollution

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Plants account for the major ratio of biomass on the earth, which plays the vital role in the ecological system. Facing the increasing pollutants released into the environment, plants are breaking through the traditional functions, such as offering the food, medicine, shelter, oxygen to human being, to stand the front line to fight the pollution to protect human's health. Plants are being involved more and more researches on dealing with pollutants, which leads to give birth to the novel and raw field to study environmental pollutants: Phytoremediation. Phytoremediation is a newly developed green technology using plants and their associated rhizospheric microorganisms to remove, degrade and metabolize the contaminants in the different environmental media, including soil, sediments, groundwater, surface water and atmosphere.

There is an emerging body of evidence showing that phytoremediation is effective way to fight the environmental pollutants at both high and low concentrations. For example, as the part of environmental recovery, plants were used for cleaning up the spilled oil and restoring the ecological environment in the Gulf Coast after the Deepwater Horizon accident in 2010. Highly tolerant and effective plants were being screened to fight the oil pollution. In one paper of this special issue, *Schizolobium parahyba* (tower tree), *Mimosa scabrella* (bracatinga) and *Enterolobium contortisiliquum* (earpod tree) were used for reforestation of degraded areas contaminated with petroleum derived compounds (diesel and gasoline). Results suggested that the most tolerant species to diesel is *Enterolobium contortisiliquum* and that to gasoline is *Mimosa scabrella*, respectively.

Phytoremediation as green, economical and effective technology was widely accepted by an increasing number of researchers in the whole world. More and more papers on phytoremediation were published in recent years. Furthermore, getting together the scientists and companies from the world, the 10th conference of international phytotechnologies focusing on phytoremediation was successfully held in 2013, covering all the traditional topics, such as persistent organic

pollutants and metal remediation, and novel and hot topics, such as the interaction of plant and nanoparticles.

During the research process of phytoremediation, some plants are developed to be the model plants, such as *Arabidopsis thaliana* and *Populus*. These model plants also facilitate the researches on the emerging environmental pollutants. Recently, research on the interaction of plants and nanoparticles is becoming burning-hot topic following the wide application of nanoparticles, which leads to the release of large volume of nanoparticles into the environment. These model plants offered the preliminary results to assess the potential effects of nanoparticles on human being, including toxicity, transport and accumulation of nanoparticles in plants, which implies the similar effect on animal and human being. More importantly, plants have shown the great ability to adapt the invasion of nanoparticles and translocate the nanoparticles from roots to shoots. However, the corresponding mechanisms behind the nanoparticle translocation are still unknown or uncertain. In addition, as green method, plants can also be used to synthesize the fine nanoparticles during the phytoextraction of some metals, like gold and silver, from the contaminated soil.

All in all, due to special properties of plant, phytoremediation has a lot of advantages to be used in the process of dealing with the pollutants. Firstly, plants can survive in different conditions, even the extreme condition, so that there are native plants everywhere to be applied for phytoremediation. Secondly, plants can grow from the seeds, which are easy to store and use. Furthermore, the transgenic plants can be developed for enhanced phytoremediation of pollutants. Thirdly, some fuel plants, such as soybean, can be used to remove the pollutants and harvest the fuel at the same time. Finally, considering the animal rights during the experiment, there is no restriction of "PlantRights" for phytoremediation. Therefore, phytoremediation will be the powerful and effective weapon to fight the environmental pollution.

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