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Effect of Mycorrhiza, Zeolite and Superabsorbent on Early Growth and Seedling Establishment of *Agropyron elongatum* in Mining lands (Case Study: Mashhad Shargh Cement Factory, Iran)

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Extended Abstract

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Introduction: Heavy metals have become one of the sources of soil contamination as a result of human-induced mining for metal extraction. Early establishment of seedlings under the unfavorable environmental conditions of mined lands is a major stage that is often faced with failure. This is due to the shortage of precipitation, high evapotranspiration, poor soil nutrients, disturbed layers of soil and instability of soil in the mined lands of arid and semi-arid regions. Hence, facilitating early establishment of seedlings by employing new substances and technologies such as zeolite, superabsorbent and mycorrhiza can be considered an important step towards the restoration of degraded lands in the vicinity of mines in arid and semi-arid regions. Some materials that can be used to reclaim degraded mining lands include zeolites, superabsorbent or hydrogel and mycorrhizal bio-fertilizers. Initial establishment and production of plants should be studied under real conditions, which will make it possible to assess the feasibility of such substances for possible commercialization.

Materials and Methods: The effect of mycorrhiza (*Glomus intraradices*), superabsorbent (A200) and zeolite (Clinoptilolite) on the establishment and production of *Agropyron elongatum* species in the soils of the abandoned mines

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around Mashhad Shargh cement factory was studied in 2015-2017. The experiment was based on a randomized complete block design with four replications, consisting of four treatments (mycorrhiza, zeolite and superabsorbent). The measured traits included plant establishment percentage, plant height, mycorrhizal colonization on roots, aerial and root dry weight and total dry matter. Method of Giovannetti (Giovannetti *et al.,* 1980) was used to determine the rate of bacterial colonization on the plant roots. The data from the experiment were categorized using the Excel database software and the charts were drawn. Analysis of variance was performed by SPSS18 and Minitab16 statistical software.

Results & Discussion: Based on the results of variance analysis, the treatments such as zeolites, mycorrhiza and the superabsorbent had significant effect on total dry weight, shoot dry weight, root dry weight, plant height and *Agropyron elongatum* establishment percentage in the area. The application of mycorrhizae, zeolite and superabsorbent facilitated the primary establishment of plants by, respectively, 46, 46 and 8 percent. The plant height of the seedlings under zeolites, mychorrhiza and the superabsorbent treatments increased by 65, 54 and 48 percent compared with control, respectively. An increase of 40-73 percent was observed in the above-ground dry biomass of the seedlings subjected to the experimental treatments. The total dry matter biomass of *Agropyron elongatum* plant rose by 56, 52 and 25 percent in zeolites, mychorrhiza and superabsorbent treatments, respectively relative to control treatment. The Application of both the zeolite and mycorrhizae treatments respectively increased dry root weight by 38 and 36 percent relative to the superabsorbent and control treatments. The use of mycorrhiza increases plant resistance to environmental stresses, improves rate of photosynthesis, enhances plant growth and boosts yield and absorption of water and nutrients by plants (Wong *et al.,* 2007). Superabsorbent polymers can improve plant growth and contribute to yield increase under normal and stress conditions by increasing water-holding capacity of soil and decreasing nutrient loss through leaching. It is reported that the zeolites have a positive effect on improving morphological characteristics of *Malva sylvestris* (Ahmadi Azar *et al.,* 2015).

Conclusion: According to our results, *G. intraradices* mycorrhiza and zeolite can be recommended as effective and affordable treatments to increase yield and support the initial establishment of *Agropyron elongatum* plant. They can also aid in vegetation recovery of lands contaminated with heavy metals in the mining affected areas of Mashhad Shargh cement factory.

Keywords: Field, Heavy metals, Rangelands, Seedling transplantation.

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