Effect of rice straw and wood chips on Soil erosion and seedling growth on the fill slope of forest roads

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Article History (Received: 10.07.2018 Accepted: 07.10.2018)

Extended abstract

1-Introduction

Erosion is a geomorphologic and natural process that is always seen across the world, but this process is triggered by human activities, such as road construction, resulting in a significant negative impact on water resources, soil, environment and national economy. According to the above, preventing soil erosion is an important target in the management and conservation of natural resources. Basic measures to reduce road environmental damage begin at the design stage. There are, however, erosion-sensitive areas in the embankment slopes that are created in various dimensions and in different ways during use of the road. Areas with mild slopes and low area, over the time, are naturally stabilized and restored, but larger or sloping mountainous areas, are stabilized and rebuilt or, despite the passage of time, not only stable, but also increasing the extent of destruction levels. Geotextiles are additives and permeability that are used in conjunction with soil, rock, or any materials associated with geotechnical engineering as a supplement, which modifies and sustains the soil structure. Geotextiles are divided into two groups of the original structure and the original disorganized structure in a general classification. They are made of synthetic fibers (polypropylene, polyethylene, and polyamide) or natural fibers (hemp, coconut fiber, chips, rice straw and grains, palm leaves) in different designs in terms of size and shape and according to their functions and needs. In this study, the effectiveness of protective treatment, including two types of uncontrolled natural straw geotextile and rice straw and wood chips on the establishment and emergence of two species of woody and native forests including alder forests and forest canola (jaw), as well as soil erosion In the ridge of the forest road was carried out.

2- Methodology

After preparing the ground, two experimental treatments including straw and chips of rice, wood chips (due to abundance, low cost and easy accessibility), along with the planting of one-year-old seedlings of two species of forest species of Ader and forest witch (due to natural presence in Similar areas of erosion, indigenousness, easy establishment, rapid growth, abundant rootstock, and low airy zipper (Tuttle et al., 1992) in three completely randomized blocks, and similarly, at a surface of about 72 square meters (12 × 6 m 2)) used. Each block was divided from the margin of the road down the slope and in the direction of the slope into three rows (repeating) and each row in the direction of the alignment lines to three plots of 8 square meters (4 × 2 m 2). Therefore, each block was consisted of 9 sub plots of 8 square meters that were planted in each row (replicate) in a subset of Alder and the next plot of willow forest with density of one seedling per square meter. The remaining Crete had no seedlings in each row. The method of planting and planting seedlings in plots was based on species type and random systematic. Therefore, in each block, three plots were used for the alder species, three plots for forest beet and three plots without seedlings and no cover (control) and the plot was split plot. All of the plots in each block were enclosed around the plots in order to prevent the penetration of water and the spillage of rain fed particles into adjacent plots. Runoff and precipitations from the rain after passing through the outlet were transferred to a runoff tube (120 liters). All blocks and plots were completely identical and the blocks were separated by type of treatment and plots according to the type of planted species.

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3- Results

The results of field studies showed that the control treatment had the highest runoff and sediment mass in comparison with the protective treatments, followed by straw and chalk and the lowest amount of runoff and sediment volume was related to woodchip treatment. In general, the difference between protective and control treatments was significant. In other words, protective treatments had significant effects on decreasing runoff and sediment mass (soil loss) ($P \leq 0.05$). There is no significant difference between protective treatments, but the particle has the highest effect. The average of total runoff for control, straw, and shredded and woodchip plots was 6.99, 6.36 and 3.21, respectively. The mean amount of sediment mass for the control plots, straw and chips and wood chips. The ordering was equal to 5.35, 2.71, and 1.71 g. Straw, chop and chipped wood reduced the concentration of sediment (inflorescence) ($P \leq 0.01$). In the meantime, the straw had the greatest impact. The mean concentration of sediment for control plots, chips and straw and chaff were 1.55, 1.37 and 1.18 g / liter, respectively. The results of soil moisture content in experimental plots during the measured period and in relation to rainfall intensity showed that soil moisture changes were similar for all treatments, but the observed difference was observed in their absolute value. Soil moisture content at 2 cm depth of soil in straw, wood chips and control plots was 11.49%, 10.68% and 9.4%, respectively. In other words, protective treatments have a significant effect on soil moisture increase. The depth was 2 cm (0.01 P ≤). The results showed that the effect of experimental treatments on grass cover of plots was significant ($P \leq 0.01$) and reduced the percentage of grass covering. The average percentage of grass covering for trees, chips and straw was 48%, 37% and 36%, respectively.

4- Discussion & Conclusions

The reason behind the reduction of soil loss in protective plots compared to the controlling can be attributed to the fact that the use of straw and chips of rice and shrubs that cover the surface of the plots prevents the direct collisions of rain drops with the soil area of the plots and the amount of roughness Thus increasing the surface, thereby reducing the energy and rainfall erosion power. Compared to protective treatments, wood chips due to wooden texture and hard fibers which blocked the flow of water and caused more water penetration in the soil and had the greatest effect on reducing the volume of runoff and sediment yield. Similar to the results in western India, hard and rough coconut fibers were able to reduce the erosion rate by 99.63% over the projected period (before the season or season of Monsoon) and 95% after the Monsoon period of 57%. The reason for this reduction is due to the presence of a protective layer that absorbs the effect of the energy of the movement generated by the rain drops and thus prevents erosion. In the semi-arid region of the north, the coffin mat and the polyester mattress reduced the average sediment content by 99/4 and 98 / 4% and the polyester network by 5 / 5 %, respectively. Although straw, chips and wood chips compared to control (bare soil), because of their ability to maintain water, soil moisture and reduce soil loss, the growth of the diameter of the collar was 39/84% and 31/92 %. The height of the seedlings increased by 4/51% and 2/92, but their effect was not significant. Increasing water and food storage capacity in the soil can improve the growth and growth of the seedlings, as well as the proper development of its root surface. As a result, in dry months of the year (two months a year) the plants keep the drought stress. This is particularly important in the reconstruction of the slope. Straw and Chicha had the highest effect among treatments due to their ability to maintain water and maintain soil moisture. The mean of collar diameter and height increment of *Alnus glutinosa* was significantly higher than *Salix alba.* In general, results of this study showed that the use of natural geotextiles had significant effects ($P \leq 0.05$) on reducing runoff and sediment. Therefore, on erosion areas and steep slopes, using these bio-engineering methods could help seedling establishment and soil erosion reduction.

Keywords: Soil Conservation, Sediment, Runoff, Bioengineering, Natural Geotextiles.