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Use of geotextiles in agriculture: A review study

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Abstract
It is a natural product and eco-friendly in environment and also a lightly fabric which is made up of jute, coco-coir, and plant fibers. It mainly acts as a neutral product and also eco-friendly in nature. Geo-textiles mainly which helps and protect from natural resources in soil and water. These are very high in natural substances for plant growth and it helps to support some of the essential nutrients in the soil by the lignin decomposition. Now a day's geo-textile is having many applications and currently used to civil engineering applications like roads, airfields, reservoirs and construction site etc. These Geo-textiles are used for wick drains and blanket drains. Geo-textiles are made up of manmade materials and it is used to improve soil condition. These are also having a great impact for protecting natural disaster. Now days these can protect bridges roads and soil from natural disaster etc. It also used for to identify the soils and soil quality.

Keywords: geotextile, soil properties, crop production, mulching and soil erosion

Introduction

The word Geo-textiles which comes from Geo and textiles. Geo means 'ground' or 'Land', related to soil. According to the word "Textile" which means a general term applied by a manufacturer from fibers, filaments, by flexibility and by fineness and ratio of length to thickness. Naturally occurring jute agro geo textiles are eco-friendly and biodegradable products which act as surface cover materials and useful ameliorative to eliminate soil related constraints to crop production (Yong *et al*, 2000; Pain *et al*, 2013 and Adhikari *et al*, 2016) [2, 13, 26]. It is generally made from natural fibers and manmade fibers. Geo-textiles look like very durable, soften. Geo-textiles are also known as Geo-synthetics. It is very helpful to environment science to design to design of environment. A geotextile is designed to be permeable to allow the flow of fluids through it or in it, and a geo membrane is designed to restrict the fluid flow (Mitchell *et al*, 2003) [9] Geo-textiles can be made from either from natural or synthetic fibers. Geo-textiles will also form to organic mulch and also in weak establishment of vegetation. Natural fiber geotextiles degrade to form organic mulch and help in quick establishment of vegetation. Different fibers will degrade at different rates e.g. coir geotextiles degrade in 2-3 years while jute degrades in 1-2 years (Adhikary *et al*, 2019 and Pal *et al*, 2020) [1, 14]. Coir is therefore useful in situations where vegetation will take longer to establish, and jute is useful in low rainfall areas because it absorbs more moisture. Eco geotextile another similar soil conditioner, are equally effective in erosion control, stabilization of soil slops and increasing water retention capacity also improve crop productivity (Rajgopal and Ramkrishna, 1997) [17]. Jute geo-textiles will be degraded in 1-2 years, sun hemp, coco-coir geo-textiles and banana leaf fiber. In future the different type of geo-textiles for preventing soil degradation and maintaining suitable crop production. By using of different types of geotextiles by managing some of the practices which are involved in organic resources and it effect on improving soil fertility, and in soil health and sustainable crop production. In addition to the characteristics of Geo-textiles identifying and application of Geo-textiles which depends mainly on soil type, soil compaction, moisture content, liquid limits, plasticity index, bulk density, soil, pH, Iron/ Calcium content, clay/ silt and sand composition, etc. Geo-textiles are well used for re-vegetation and soil stabilization where the upper layer of the soil to be preserved from water and wind, soil moisture during the establishing vegetation cover. Application geotextile in soil location specific so in addition to the geotextiles characteristics, identification and geotextiles application depends on type of soil, soil compaction, moisture percentage, liquid limits, plasticity, bulk density, soil pH, iron/ calcium content, clay / silt and sand composition, sloping land and hydraulic action (Adhikary *et al*, 2019) [1]. Geotextiles used for re-vegetation and soil stabilization and wherever the upper layer of the soil has to be preserved from wind and water erosion and conserved soil moisture during the establishment of a vegetation cover (Pal *et al*, 2020) [15].

Geotextile in Agriculture

Ahmed (1993) [3] reported that influence of composted coconut coir dust (coirpith) on soil physical properties, growth and yield of tomato. In a field trial with tomato cv. pusa ruby on an Alfisol soil, composted coir pith (5-20 t/ha). Improved soil condition and bulk density) and moisture retention capacity compared with 10 t FYM/ha. Fruit yields were greatest (19.01 t/ha) with FYM, followed by 20 t coir pith/ha (16.97 t fruit/ha) and were lowest in controls (11.23 t/ha), which were treated with neither FYM nor coir pith. Hongal *et al*, (2010) [7] reported that effect of green manures and nitrogen levels on the soil properties. A field experiment conducted that effect of green manures and nitrogen levels in cotton + chilli cropping system was evaluated. Sun hemp recorded higher phyto mass (25.58 ton/ha) followed by cowpea (22.44 ton/ha) and green gram (14.40 ton/ha). Similar trend was observed in biomass production and Accumulation. Eco geotextile another similar soil conditioner, are equally effective in erosion

control, stabilization of soil slops and increasing water retention capacity also improve crop productivity (Rajgopal and Ramkrishna, 1997) [17].

Soil erosion control

A field experiment was conducted by Paterson and Barnard (2011) [16] in South Africa Beneficial effect of palm geotextiles on inter-rill erosion. Geotextile mats made of woven palm leaves showed potential using a rainfall simulator for their effectiveness in reducing surface runoff and sediment load from a range of South African soils and mine tailings. Rickson (2000) [18] another experiment reported that geotextiles can be used to control soil erosion and establish vegetation on disturbed landscapes or newly constructed sites. Smets *et al*, (2009) [21] conducted a field experiment that impacts of soil tilt on the effectiveness of biological geotextiles in reducing runoff and in rill erosion. Bhattacharyya *et al*, (2010) [5] reported that for rain splash erosion control use of palm-mat geotextiles. Smets *et al*, (2007) [20] conducted a field experiment on palm- leaf geotextiles could be an effective and cheap soil conservation method with enormous global potential. Effectiveness of palm geotextiles reducing soil erosion from water. Rickson (2006) [19] got report that controlling sediment at source an evaluation of erosion control through geotextiles.

Use as mulch

Wilen *et al*, (1999) [25] got result that weed control efficacy of organic mulches as well as a copper hydroxide-coated geotextile (fabric) disk was examined using rhaphiolepis indica cultivars Snow White and pink or callistemon citrinus growing in containers. Nag *et al*, (2008) [10] reported that a layer of mulch spread on top of the soil to soil moisture conserve, reduce growth of weeds, prevent erosion and large fluctuations in soil temperature. Effect of mulching of plant materials on the growth of ground cover plants and emergence of weeds on levee slope. Otani *et al*, (2009) [12] reported that ground cover plants are useful for weed suppression on levee slopes. However, weeding is necessary until the slopes have covered with ground cover plants. Kaku *et al*., (2007) [8] reported that Geotextile mulch had become popular recently in the installation of landscape ground cover, because it provides both suppression of weeds and maintenance of soil conditions desirable for cover-plant growth. Walsh *et al*, (1996) [24] reported that the effects of cultivation, straw mulch, geotextile mulch, grass cover, a cover crop mixture of lupin (lupinus albus) and wild carrot

Soil properties

Thomas *et al*, (1987) [23] reported that the geotextiles have been employed to reduce lateral deformation of bridge approach embankments and to prevent closure of the expansion devices in the bridges. This concept will be implemented in an existing bridge undergoing reconstruction. Andre and Gerand (1988) [4] reported that geotextiles made from synthetic fibers are used in drainage applications. this function can be assumed for many years if no alteration or changes of their structure results from chemical attack, mechanical deterioration, mineral and bacterial clogging and accumulation of particles, or organic matter between or upstream of the fibers. Chen *et al*, (2009) [7] reported that the water absorption characteristics of geotextile can influence runoff producing process directly, and their decomposition characteristics relate to the geotextile durability for soil and water conservation. Olesen *et al*, (1995) [12] reported that geotextiles are any textile like material used to enhance soil structural performance. Bio based geotextiles are used for short term (6 months to 10 year) applications where biodegradability is a positive attribute, such as mulching and erosion control. Biswas *et al*, (1970) [5] reported that the nature of organic matter played an important role in the development soil structure owing to differential nature of by products produced during the process of decomposition. Rajagopal and Ramakrishna, (1997) [17] describe properly about to improve the soil organic carbon (Soc) and soil by the application of geotextile. Sinowski and Auerswald (1992) [23] studied that fleece used as a geotextile maintained its water holding properties and varied its speed of wetting after each application. The erosion protection of the tested geotextiles was increased by 30, depending on the effect of covering. Soil infiltration was improving ore with geotextiles than with fallowing.

Conclusion

Now days the climate changing is occurring very rapidly, and mainly the probability of happening the natural disaster is also increasing. So, that the world agriculture wants to change in scientific way, which make soil more healthy and get more yield. Ecofriendly geotextile can apply to field for longer effect in agriculture. It can also increase the strength of the soil layers.

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