Significance of Agro Textiles in Crop Production

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Abstract

Agriculture is a major sector of Indian economy and an important employment provider. Agro textiles are the application of textile materials in the field of agriculture manufactured by involving various techniques to limit the use of pesticides and herbicides during crop production, crop protection, storage and transportation. For successful application as Agro textiles, a material should have properties to withstand solar and ultraviolet radiations and should have good protection capabilities along with being Bio degradable. Agro textiles have various usages not only limited to crop protection but also used for water management like drip and sprinkler system and for lining of ponds to prevent seepage and evaporation. Mainly knitted fabric is used for this purpose with varying GSM and composition depending on the application and properties required from the textile material. Studies suggest that there is a possibility of 10-40 per cent loss in crop production due to climate change and increase in atmospheric temperature in next 30 years. Increasing usage of agro textiles which help in providing a controlled environment for the crop to grow in most favorable conditions can help in improving the efficiency of agriculture sector. It is important that enough awareness regarding benefits of agro textiles is created to increase its usage and decrease its cost to make commercially viable and acceptable and bring the prices at par with international supply chain.

Keywords: Agro industry, Textile industry, Agro textiles, Biodegradable products.

Introduction

It is truly said that agriculture is the backbone of India. It is a major sector and one of the most important employment providers in India. Deshpande (2017) in her report on State

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of Agriculture in India stated that the agriculture sector contributes around 17.5 per cent of our total GDP and approximately 10 per cent of our export is of agriculture related products. She also pointed out that 50 per cent of our workforce is directly or indirectly involved in Agriculture sector. Another sector which has significant contribution in the economy of our country is textile sector. Textiles, in some form or the other, have always been of use in the agriculture industry, but initially, the usage was restricted to packaging of the agricultural produce. Kapoor et al., 2017 gave an overview of agro textiles and said that a textile fabric has a long history of application in agriculture. Marasovic, 2019 said that the significance of agrotextiles can be substantial all over the world since it has proven to be very versatile and cost effective materials. The word Agro-textiles now is used to classify the woven, nonwoven and knitted fabrics applied for agricultural & horticultural uses covering livestock protection, shading, weed and insect control, and extension of the growing season. Agro textiles help to keep sufficient soil humidity and increase the soil temperature. Chowdhry et al., (2017) studied importance of agro textiles and suggested that Agro-textile is a crucial and emerging sector among all the twelve sectors of technical textiles. It covers all the textile products from horticulture application to fishing and animal husbandry application. In Bangladesh, some application of agro-textiles products has shown great extent of outcomes and it has positive impacts on growth and production of various crops including vegetables. The use of agro-textiles helps the farmers to minimize the use of harmful pesticides. About 40 percent energy can be saved by the usage of greenhouses (Paul et al., 2012).

Ajmeri (2016) stated that textiles have found their use in agriculture for thousands of years to protect the plants and animals against adverse environmental conditions. Diversity of textile products are profitably used in agriculture like fishing nets, ropes, shade nets, jute bags, mulch mats, etc. Many companies have built competitiveness and obtained tremendous profits through new product development. Global competition in textile has become more intense and the firms need to be innovative to compete (Choi, 2005).. Agro textile sector is gearing hard to improve the efficiency of crop production by using suitable agro textiles so that better crop yield can be achieved year after year. (Kapila, 2019)

However, the latest development in the field of textiles, especially the technical textiles, have made this sector indispensible for the agriculture industry and in a way, has come

forward as the backbone of agricultural industry. Subramaniam et al., (2009) suggested the fact that in era of modernization the agro-textiles will serve the purpose to boost the high productivity in agriculture sector. The technological advancements have enabled the textile materials find their irreplaceable use in areas like agriculture, horticulture, livestock and fishery. This class of textile materials used in agriculture sector is known as agrotech segment of technical textiles. The textile materials hold a great potential for improvement and enhancement in the quantity and quality of the agricultural products. (Bhatt et al., 2019) These textiles also protect the plants from the climatic change and its harmful effect on the plants (Agrawal, 2013).

Agro textiles can be termed as the application of textile materials in the field of agriculture. Textile manufacturing involves various techniques like weaving, warp and weft knitting, and some non woven techniques. The textile materials prepared by any or a combination of these techniques are effectively used today for crop protection and storage of the products. These textile materials have not only helped in limiting the use of pesticides and herbicides during crop production, but have also influenced safe storage and transportation of agriculture production thus improving the efficiency and productivity of agriculture sector and reducing damage to environment. Constant innovations are going on in textile industry so that a suitable material can be produced for crop protection purpose which is also cost competitive so that large number of farmers can achieve the benefits.

The textile industry is innovating with fabrics in order to produce a superior quality product and also give price competitiveness so that more and more farmers can be inclined towards usage of agro textiles for crop protection and storage purpose. The requirement of innovation in a global market for a qualitatively superior product which can be suitable to the climate differences in a country as vast as India and is also suitable to the local needs has forced the textile companies to work extensively in this field. The products thus created have proved to be beneficial to the crops and has been replacing traditionally used products in agriculture due to their cost effectiveness and efficiency (Sankhe et al., 2002). As per a report by "Grand view research" on the global market size of agro textiles, it was estimated that the demand for agro textiles to be used specifically in agriculture applications is expected to reach 558 kilo tons by 2025 and is growing at an estimated CAGR of 4.4% from 2017 - 2025. The global agro textiles market is expected to reach USD 12.77 billion by year 2025 (Basu, 2011). The fabrics used in crop production not only help in increasing

productivity but also improves crop quality and prevent losses due to weather extremities (Paul et al., 2012a).

Properties required in Agro Textiles:

The Agro Textiles are required to be consisting of the following properties:

1. They should be able to withstand solar radiation.
2. They should have the capacity to withstand ultraviolet radiations.
3. The textiles should be Bio degradable.
4. They should have high potential to retain water.
5. The textiles should have good protection properties.

Application of Agro Textiles

Wind Break and Hail Control Fabrics:

Agro textiles are used to prevent plants from wind and hail storm. These are specially required in areas where wind speed is considered to be high. Normally plants which are protected from wind are healthier and reach full growth rapidly. These fabrics are tough, strong and heavy duty netting usually of 110 GSM. It reduces wind speed by 50 per cent and also sunlight by 50 per cent of its strength. Hail protection fabrics help shield vines from damage to the fruits and defoliation which are associated with hail while allowing enough sunlight for the growth of plant. These are made of UV stabilized polyethylene filaments which could be both knitted and woven.

Sun Block Fabric:

Sun Block or Sun shade fabrics are made up of polypropylene mono filaments in both knitted and woven constructions and absorb 90 per cent of sunlight. These are used to develop a micro climate for plantation of ornamental plants, fruits and flowers. Woven sunshade fabric is made from 100% polypropylene monofilament strands and knitted sunshade fabrics is made from 100% UV stabilized polyethylene. U V stabilized high density polyethylene fabrics also resist mold and mildew growth and protects plants from direct sun while allowing water and air through.

Temperature Control Fabric:

Spun bound polyester fabric used for temperature control is designed to save crops from cold, insects, frost and a large number of adverse environmental factors. These fabrics are used to capture heat on sunny days and retain the heat radiating from the ground at night. Frost and cold protection fabric protects plants from frost kill during unexpected late cold snaps and unseasonably early ones.

Landscape covers for Weed Control:

A development in Agro textiles is a special synthetic material used with mulches for weed control. These fabrics retard the weed growth by acting as a barrier between mulch and soil. It also permits the exchange of air and water between the atmosphere and the soil. It reduces watering requirement allowing nutrients to permeate and lends insulation to root system against sudden temperature change. These fabrics are easy to lay and cuts down on garden maintenance. It is available in 50, 70 or 100 GSM and is made of spun bonded polypropylene non woven fabrics.

Insect Proof Fabrics:

Insect control netting prevents damage from pests to the plants and gives a way to safeguard the vegetables and plants without disturbing the climate. These fabrics are UV stabilized woven fabrics made from high density polyethylene (HDPE), polypropylene or polyester and possess a suitable mesh size to keep away pests while allowing water, air and light to reach the fruits. It blocks most insects like aphids, potato beetles, Japanese betels, grasshoppers, leaf miners, cabbage worms, root maggots etc and result in higher yield due to decreased pest pressure. It also helps in breaking the cycle of pest infestation and removes need for insecticides. These nets are reusable and can be used for multiple seasons. It is important to apply insect netting at proper time because if it is installed after the infestation has occurred even if infestation is not visible, it will not solve the pest problem.

Rain Protection Fabrics:

These fabrics are used in the areas of heavy rainfall especially to protect the fragile flowers and berries from getting damaged from rainfall. These are made of grid structure to serve the main purpose of saving from rain.

Bio Barriers:

Bio Barriers are root control systems which prevent adjacent structures from damage by root. It is used vertically and deflects roots as its nodules slowly release Trifluralin preventing root tip cell division. Prevention of root growth results in healthier trees. It is placed besides the object to be protected and the roots growing into the zone are redirected while roots outside the zone continue to grow normally; tree health is not impacted since Trifluralin is not systemic. Since the system includes a standard drainage fabric, Biobarrier allows water, air and nutrients to pass through, not adversely affecting soil hydrology. Though its most common use is along the hardscapes to prevent damage from roots, it is also used inside larger pots as it prevents roots from growing through drain holes and attaching to native soil. Also in the case of removal of trees, less labour is required for harvesting and less damage is caused to the roots. It also prevents weed growth as weeds are unable to develop a strong root system in the mulch layer while ornamental tree and shrub roots expand unimpeded below the Trifluralin emitting fabric layer, eliminating unwanted competition and maintenance cost.

Root Pruning fabrics:

These fabrics have special application in nurseries or in hydroponics and results in healthier roots which are able to provide more nutrients to the plant. Usage of these fabrics result in trapping of roots by the porous fabrics and when these root tips come in contact with air outside the pot, they are naturally pruned. This pruning process forces lateral branching of fibrous feeder roots which are more productive in the uptake of water and nutrients. As a result, plants are more healthier utilizing the entire root zone for optimum plant growth.

It is important that enough awareness regarding benefits of agro textiles is created to increase its usage. Apart from crop production, agro textiles are also used in water management field like for drip irrigation and sprinkler irrigation system and for lining of ponds to prevent seepage and evaporation. Low density polyethylene films having thickness of 100- 250 microns are used for this purpose made by co- extrusion blown film technique. Research is undergoing to use knitted net hose for water transportation, use of water retention nets coated with super absorbent polymer resins and composites of hemp or polypropylene for reducing soil pollutants and other similar developments which have the potential to improve crop efficiency and cost effectiveness of farming.

Conclusion

Studies suggest that there is possibility of 10-40 % loss in crop production due to climate change in next 30 years. Steps need to be taken to prevent this loss and increasing usage of agro textiles can help in improving the efficiency of agriculture. Efforts need to be made to decrease cost to bring the prices at par with international supply chain. With proper steps, next green revolution will occur with the help of agro textile technology.

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