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Efficacy of Jute Based Agrotextile Mulches

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Mulching is a crucial agronomic technique that can be used in both agricultural and horticulture production. Mulches were first used in 1930 due to their ability to control weeds, conserve soil moisture, and regulate soil temperature. Mulches protect the soil from wind and water erosion and compaction, which all directly contribute to root stress and poor plant health. Any substance other than soil or active plant that serves as a permanent or semi-permanent protective cover over the soil surface is referred to as "mulch." The advantages of mulching have been linked to improvements in the physical, chemical, and biological qualities of the soil, as well as to the mulch's ability to shade the area and lessen the impact of raindrops. Mulch helps in controlling soil temperature by keeping it cooler in the summer and protecting it from chilly winds in the winter. Mulches are one of the best strategies to boost agricultural output while also protecting plants from specific factors that affect agricultural productivity and yield. Although it is common practice to mulch using synthetic (polyethylene film) or organic (crop leftovers) materials, geotextiles or agrotextiles are more successful at altering the soil's environment, controlling weeds, and boosting crop yield. Non-woven jute agrotextiles are more effective in controlling weed development than woven ones, requiring less physical labor and less herbicide use but still increasing agricultural yields of groundnuts, broccoli, and other crops while retaining soil moisture. The woven jute agrotextiles can also be used successfully to control soil erosion and weed growth.

What are agrotextile mulches?

Agrotextiles, also known as geotextiles, are permeable textiles consisting of jute, polypropylene, or other biodegradable materials. Jute agrotextiles are a type of natural technical textile that is typically woven or non-woven and made from the bast fiber of the jute plant, which is 100% natural and eco-friendly. They are used on soil to increase agricultural productivity by enhancing the agronomic characteristics of the soil and by inhibiting the growth of unwanted plants such as weeds. The jute fibers are processed through rove spinning to produce around 125 lbs of yarn, which is then woven into fabric on a flat bed loom utilizing creels for feeding warp ends (Fig. 1). The production of the second type of nonwoven jute agrotextile (Fig. 2) begins with the garneting, cum cross lapping, and needle punching loom for mechanical bondage of the jute fibers. By forming water-stable aggregates, the commercial crops and vegetables like tomatoes, lettuce, and other vegetables are protected from the impact of heavy raindrops.

How Jute based agrotextile increase crop yield ?

- Jute textile mulches can help retain moisture by reducing evaporation and protecting the soil from direct sunlight. This can be particularly beneficial in arid or semiarid regions or during dry periods.

- The use of jute mulches can help suppress weed growth , reducing competition for nutrients, water, and sunlight, which can otherwise hinder crop growth.
- Jute mulches can help regulate soil temperature , providing a more favourable environment for plant growth. They can prevent extreme temperature fluctuation , especially during hot and cold weather.
- Overtime the jute mulches will decompose and add organic matter to the soil, enhancing its fertility and supporting long term productivity.

Fig:(1) Woven Jute Mulch Material

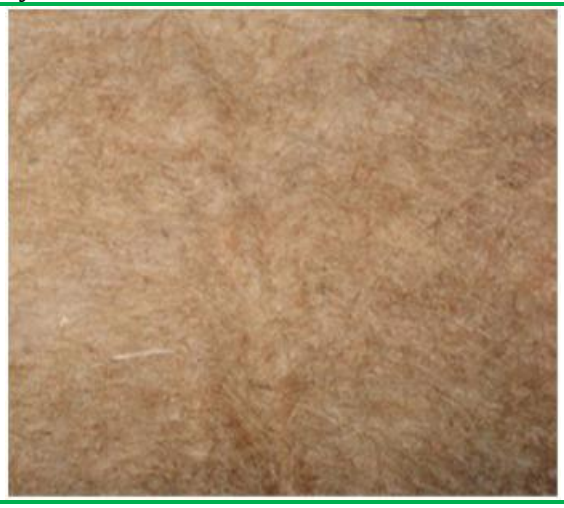

Fig:(2) Non-Woven Jute Mulch material

Effect of Jute agrotextile mulch in suppressing weed growth

When jute agrotextile mulch is spread on the soil surface between crop rows , it creates a physical barrier that prevents sunlight from reaching weed seeds and emerging weeds. This lack of sunlight inhibits weed germination and growth. Additionally, the mulch helps to retain soil moisture and regulate temperature, which can further hinder weed establishment. Jute agrotextile mulch is biodegradable and environmentally friendly , making it a popular choice for organic and sustainable farming practices. As the mulch breaks down over time, it also adds organic matter to the soil, improving soil fertility and overall crop health. Using jute agrotextiles mulch not only suppresses weed growth but also reduce the need for herbicides, leading to more environmentally friendly weed control methods in agriculture.

Impact of Jute agrotextile mulch on soil moisture conservation

- Reduced evaporation: Agrotextile mulch acts as a barrier between the soil surface and the atmosphere, reducing direct exposure to sunlight and wind. This limits the evaporation of water from the soil, which helps to retain moisture.
- Temperature regulation: The mulch also helps regulate soil temperature extremes, it reduces the rate of water evaporation from the soil.
- Enhances water infiltration: The presence of agrotextiles mulch can improve the structure of the soil. This allows water to infiltrate the soil more easily and be absorbed by plant roots.

How Jute agrotextile mulch checks soil erosion?

- Soil stabilisation: Agrotextile mulches acts as protective layer over the soil, stabilising it and reducing the impacts of raindrops and flowing water. When water hits bare soil directly, it can dislodge soil particles , leading to erosion. The mulch provides a barrier that disperses the force of rainfall, minimising soil detachment.

- Water retention: Agrotextiles mulch helps helps to retain noisture in the soil. By reducing evaporation and runoff, the mulch allows the soil to absorb more water , making it less susceptible to erosion.
- Reducing surface runoff: Surface runoff occurs when water flows over the soil surface instead of infiltrating into the ground. Agrotextile mulch helps to slow down the flow of water, giving it more time to infiltratre into the soil. This decrease the velocity and erosive power of the runoff, reducing soil erosion.

Conclusion

The developmental key for agro-textiles is the increase in worldwide population and increased demand for higher grade farm products. In order to increase yields and the quality of agricultural goods, the qualities of textile fibers are crucial in the application of agro-textiles. Mulches made of geotextiles or agrotextiles work best for changing the environment of the soil, controlling weeds, and boosting crop output. The non-woven jute agrotextiles, which have no open areas, are effective at reducing weed development, increasing the production of crops like broccoli, cauliflower, and groundnuts, among others, and retaining soil moisture. Additionally, the woven jute agrotextiles can prevent soil erosion, maintain soil moisture, and control weed growth.

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