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Spineless Cactus (Opuntia-ficus indica): Exploring an Unconventional Fodder Resource in Arid Soils

Dr. Anandkumar Naorem 01 June, 2021 9:44 AM IST



Spineless Cactus

Introduction: Search for unconventional fodder resources

The rising population coupled with climate change has been threatening the global food and nutritional security.

There is a growing concern on how agriculture will cope up with these challenges. Arid regions are characterized by low rainfall and higher evaporation. The little effective precipitation leads to low high plant biomass and therefore, low vegetative cover is one of the main r

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With these challenges, the food security of a densely populated country such as India has to be compromised owing to low productivity of ruminants due to shortage of proper feed during dry seasons. Livestock-based agriculture is predominant in the arid regions of India. To maintain the nutritional health and productivity of livestock is another challenge that are mainly faced by arid farmers. There is a continuous lack of green fodder during the driest seasons of the year. A large body of scientific literature has been emphasizing on the unconventional list of fodder resources that could be grown in arid soils. Spineless cactus (*Opuntia ficus-indica*) is one such example in the list.

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Spineless cactus: The physiology

Cactus pear [*Opuntia ficus-indica* (L.) Mill.] has drawn worldwide attention because of its spineless properties, high water content, low water requirement etc. that can serve as a good supplement fodder in dry areas. Few epithets given to this drought resilient crop are “Green gold”, “Future plant”, “Sacred plant” and “Fruit for the poor”, that convey agro-ecological importance of cactus pear. The present spineless form of *Opuntia ficus-indica* is the result of continuous long selection process in cultivation. It was originally originated in Central Mexico during the eighteen century and introduced to other continents by navigators who used the cactus pear to prevent scurvy as it is rich in vitamin C. Unlike other crops, cactus is a CAM (Crassulacean Acid

Metabolism) plant that allows its high survival rate in harsh climate and offers high tolerance to water scarcity. In other words, non-CAM plants open their stomata at day time for their photosynthesis through plant losses a lot of water. However, cactus pear open their stomata at night to fix carbon dioxide that comparatively reduces the loss of water from the plant. The strong adaptability of cactus pear could be observed from its high survival rate in different types of soil.



However, high soil salinity (generally greater than 50 mM NaCl) and water logging may hamper the growth of the cactus pear since its root system is very sensitive to anoxia conditions. The growth and quality of the fodder significantly improves with the ample supply of calcium and potassium. Cactus pear love sunlight and the fruits do not grow on shaded cladodes because such conditions prevent accumulation of sufficient dry weight to support reproductive development. In terms of productivity, biomass generation by CAM plants such as cactus pear per unit of water is five to ten times greater than C4 and C3 plants.

Cactus pear belongs to class Magnoliopsida and family Cactaceae. Its horizontal root system rarely penetrates deep into the soil and therefore remains within 30 cm of soil depth. It has a peculiar characteristics of producing numerous extra roots called “rain roots” during rainfall that hydrates the cactus more than the soil. Besides the high water use efficiency of cactus pear, it possess other adaptations that can conserve soil water. The thick waxy cuticle on its stems (5-30 μm) helps in preventing loss of water from the plants. Moreover, the number of stomata per unit leaf area is usually low for cactus pear (20-530 per square millimetre).

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The large volume of water-storage parenchyma contained in the stem acts a water reservoir for the chlorenchyma, where the CAM pathway initiates and photosynthesis process occurs. During periods of prolonged drought, the chlorenchyma and parenchyma decreases its thickness up to 13% and 50% respectively, indicating greater water loss from parenchyma. As the roots of cactus pear are shallow, it helps in responding quickly to light rainfall that is more prevalent in arid regions. The small root system is another water-conserving strategy as only 12% of the total plant biomass is occupied by roots.

Why farmers must try spineless cactus as fodder?

There are several advantages on why spineless cactus must be fed as livestock fodder. The word “spineless” obviously depicts that these type of cactus don’t have thorns unlike the ornamental or wild cactus with spiny thorns. The lack of thorns in its cladodes makes the cattle easy to consume as well in handling during its cultivation. As spineless cactus is an arid crop, it does not require frequent irrigation. However, a limited irrigation of once a month can increase the growth and productivity of cactus cladodes. It can survive in degraded soils, provided the soils are not so saline that it inhibits the growth of the cactus. Therefore, it can be used for reclamation of degraded soils. The package of cactus cultivation is one of the simplest among all fodder crops. It requires minimum input and very easy to propagate. It is highly drought tolerant and can withstand high temperature throughout the year. Moreover, it is highly palatable for the livestock and high in soluble carbohydrates.

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How to plant cactus pear in your farm?

Cactus pear can be planted as an intercrop (with other crop) or a sole crop (alone) in your farm. However, before planting cactus pear, few points must be understood to generate a better yield of cactus from your field. A well-drained sandy or sandy loam type of soil is preferable for cactus cultivation. It is advisable because cactus pear cannot withstand waterlogging. Therefore, heavy clayey soils are mainly avoided for planting cactus. Areas with minimal frost risk must be preferred. Cactus pear loves sunlight and therefore must not be planted under shade.

When to plant cactus pear?

In order to avoid waterlogging in the field and reduce the incidence of pest attack, it is generally recommended to plant in the last third of the dry season. However, farmers can plant anytime of the year but the growth will depend on the prevailing climatic conditions.

How to propagate the cactus pear?

Cactus pear is vegetatively propagated. Select the varieties that are best suited to your environmental conditions. A healthy and robust cladode (medium to large) is selected from a healthy adult plant and a cut is made at the joints between the cladodes with a sharp knife. The cladode is then left under shade in a dry surface for 7-10 days so that the cut portion is healed or callus. Once the cut portion is healed, the cladode is planted in a diagonal position. Half or two-thirds of the cladode must be placed in the soil slightly tilted.

Do cactus pear produces fruits?

Cactus plants produces fruits after 1-2 years of planting. These fruits may These fruits are called “tuna” and are edible. It contains significant amount antioxidants that are beneficial to human health.

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feeding of the whole plant. Cactus must be fed with other supplements or feed. Sole feeding of cactus cladodes to cattle may cause animal diarrhea and weight loss. As cactus is low in protein and fiber, supplement must be mixed with the cladodes. Molasses must be avoided since cactus is rich in soluble carbohydrates. Cactus should be fed upto 30% of the feed ration.

Multifaceted uses of cactus pear

In addition to fodder resource, cactus pear can be exploited for several multi uses such as:

- It produces both cactus cladodes and fruit which can be used as fodder as well for industrial uses respectively.
- Several agro-industries prepare products based on the powder of cactus pear claiming nutritional benefits for human health.
- It is also used as an ingredient in cosmetics as well as medicinal purposes.
- Cactus are grown in wastelands and degraded land to combat desertification.

Brief description of the Author

Dr. Anand kumar Naorem is the head (I/C) and a soil scientist in ICAR-Central Arid Zone Research Institute, RRS-Bhuj. He has been dealing with dryland agriculture with an aim to enhance the soil health in arid regions of Kutch and actively involves in promoting unconventional fodder resources to meet the fodder demand of arid Kutch.



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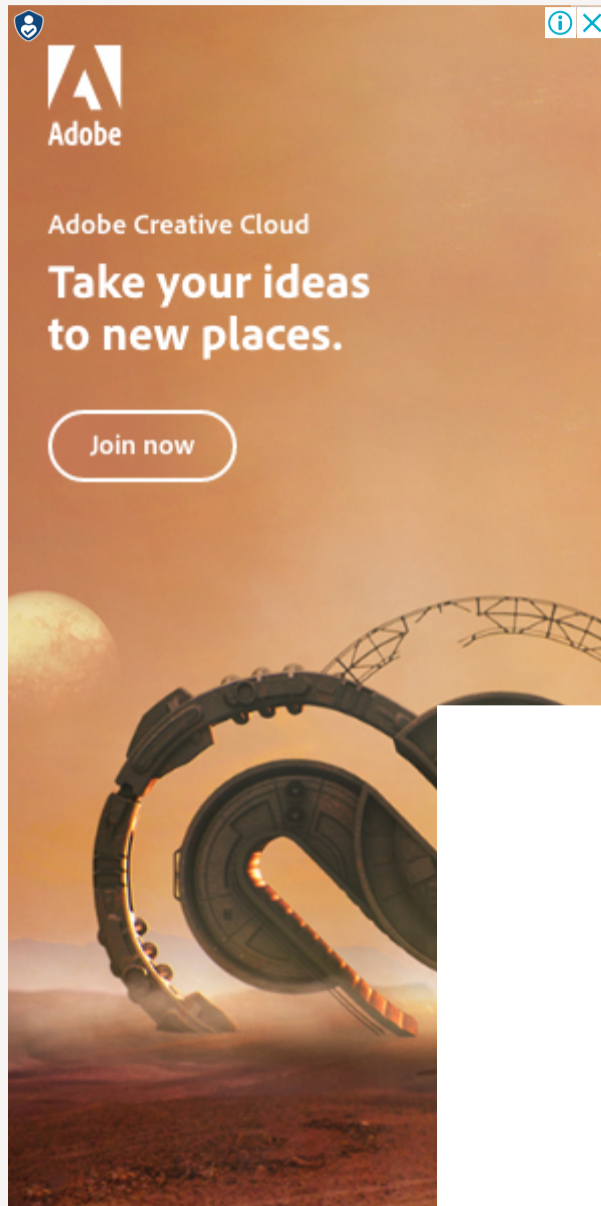
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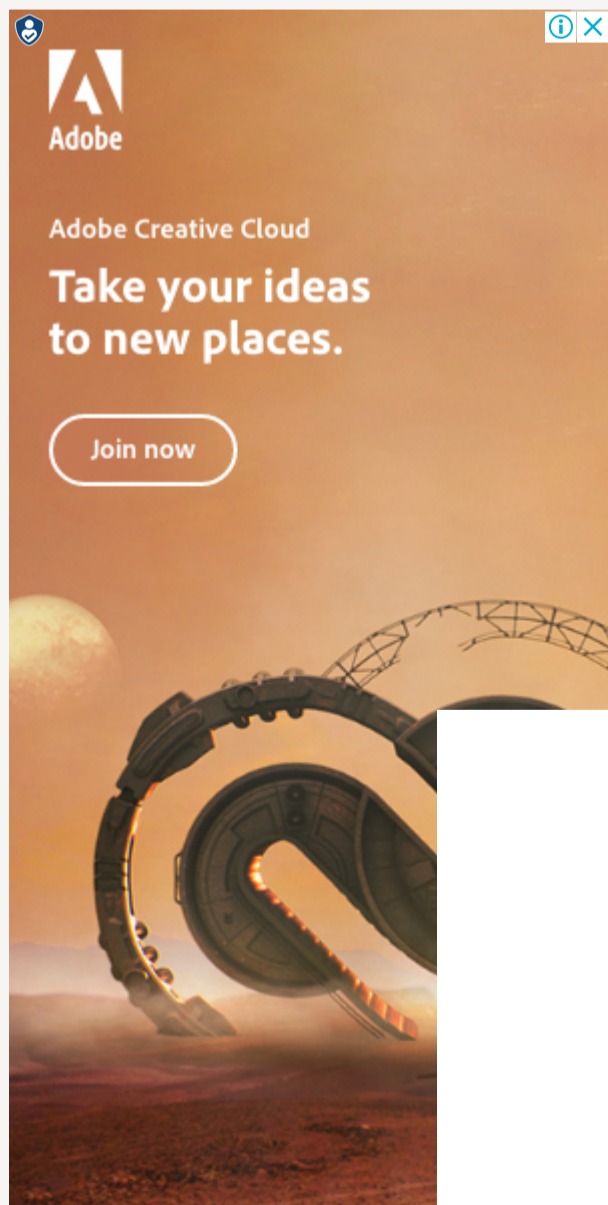
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