



Tuber Crops: Climate-Resilient Foods for Future Agriculture

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Climate change is one of the serious issues currently affecting the development of global agricultural production due to the increase in temperature, rainfall instability, and the occurrence of extreme weather conditions. Therefore, to improve the issue of food and nutrition security under such conditions, the importance of crops with the ability to resist climatic stress needs to be promoted. Tuber crops, also called root and tuber crops, play an imperative role in the development of green and sustainable production of crops due to their ability to resist climate stress conditions and high production potential. In the development of future or next-generation agricultural production, tuber crops are considered to be one of the most serious options for improving the challenges of climate patterns. Tuber crops are able to thrive well even under rain-fed and marginal conditions where other crops cannot be planted. Therefore, the development of tuber crops is gaining more importance for the next generation of green or climate-friendly crops.

Tuber Crops: An Overview

Tuber crops like cassava, sweet potato, yam, and other underground edible plant material are known as tuber crops. Elephant foot yam is also one of them. Tuberous food crops store their food content inside their underground aerial plant parts. They are mainly grown in tropical and subtropical regions of different parts of the globe. They are also an excellent source of vitamins and essential minerals apart from carbohydrates. Traditionally, tuberous food crops are grown under low-input conditions and are an important component of the food security of developing nations. Tuberous food crops are highly rewarding as their tubers are rich in carbohydrates and offer higher food productivity in a small area of land. They have a long shelf life in underground soil matter and are an important component of food security during times of food depletion. Because of all these reasons, tuberous food crops are again acquiring importance in modern-day sustainable forms of agriculture.

Climate Resilience of Tuber Crops

Tuber crops also exhibit different traits that enable the crops to resist weather extremities. Tuber crops can grow in drought conditions and resist heat as much as normal weather can. Crops can endure dry weather as they exhibit deeper and stronger roots for water absorption. They are able to tolerate different weather conditions much more than many crops. Some of the tuber crops can even recover from the impact of weather stresses, besides generating good amounts of yield. Such weather conditions exhibit immense potential in the farming of tuber crops and are found suitable for planting in different weather. Tuber crops can resist flood as much as drought. This provides much relief from the impact of dry weather during rainfall fluctuations. Besides generating higher biomass growth, these tuber crops exhibit immense potential in the farming of the same in different weather conditions.

Adaptability to Marginal and Rainfed Areas

These crops can thrive in conditions of marginal soil where fertiliser and water are low. They can mostly be grown through the rainfed pattern when other crops have failed to grow. The crops can be harvested at different times due to their inconsistency, thus catering to the conditions of the climate through regulating the entire crop pattern of growth. Moreover, tuber crops can utilise the residual soil moisture well and grow under moisture-stressed conditions. They require fewer external resources, which makes them an option for resource-constrained farmers. Several tuber crops have compatibility for integration into mixed and intercropping systems, leading to stabilising effects on rainfed farming systems. These crops promote livelihood security for small and poor farmers and contribute to support during drought-affected years. Besides these, tuber crops have potential for use on sloping and degraded land, thereby reducing soil erosion and loss through ground covers during their cultivation.

Nutritional Significance of Tuber Crops

Tuber crops act as energy-yielding food and play an influential role in the energy supply of people. They have rich beta-carotene content, such as sweet potato, and other vital minerals, such as yams and taro, containing potassium, calcium, and iron. In addition to these minerals, tuber crops do contain antioxidants with beneficial constituents for improving human well-being. Hence, the tuber crops are playing an important role when integrated into the diet of people. Improvement in nutrition security among rural, tribal, and weaker communities. Tuber crops are the best suppliers of fibre content to the body. This enables improved digestion, enhances the immune system, and helps diminish the risk of lifestyle-associated diseases. They serve as reliable suppliers of the required amount of energy for the body during conditions of scarcity of food, seasonality fluctuations, and climatic stresses due to the high carbohydrate content of carbohydrates. These varieties, especially the sweet potato with an orange-coloured flesh, have a high capacity to combat vitamin A deficiency among children and women. Tuber crop varieties have a very low level of fat, which is very appropriate and beneficial in dietary diversification and maintenance of healthy diets. Tuber crops are easily digested, which is a major advantage as they become very appropriate and healthy foods for children, the aged, and the ailing. Tuber crops are diversifiable into a wider and wider number of modern and traditional dishes, which greatly contributes to their acceptability and enhanced levels of dietary diversification. These crops have a wider capacity and are very instrumental in dietary diversification and the alleviation of the consequences associated with excessive reliance on the cereal crop.

Role in sustainable and future agriculture

Tuber crops play a vital role in achieving the objectives of sustainable agriculture through soil cover and erosion control. The crops have a high biomass production capacity that will help increase the organic content of the soil. Tuber crops fit into diverse farming systems as intercrops and integrated farming systems. With proper management practices in tuber crops, stable production will be achieved even in climatically stressful environments. Tuber crops help break monoculture trends of major cereals and promote diversified farming systems. Tuber crops help to increase soil moisture through proper ground cover, an added benefit in changing climatic situations. Tuber crops need fewer external inputs, and this improves cost and environmental friendliness. Tuber crops use less arable land and less water than their counterparts, making them highly suitable for climate-smart agriculture practices. Tuber crops have high possibilities for organic as well as low-input farming practices with no decline in productivity. There exist high values of tuber crops for value addition, creating an outstanding scope for employment generation as well as income generation in the farming sector as well. Promoting tuber crops would be highly beneficial for livelihood security as well as climate resilience for farmers. Overall, tuber crops play an incredible role in building climate-resilient as well as future-ready agriculture systems.

Conclusion

Tuber crops are increasingly becoming recognised as potential and suitable crops in ensuring food and agricultural products in future despite the climatic conditions. The three major types are tolerant to climatic conditions in comparison to other forms of agricultural products. The crops are growing in marginal conditions and have immense potential for ensuring nutrition and food in future agricultural activities. The promotion and use of tuber crops are likely to enhance and ensure food and nutrition in the future, despite climatic conditions. Therefore, tuber crops are suitable for ensuring food and agricultural products in future in conditions when the climatic conditions are uncertain and unchangeable. In view of these challenges and uncertainties in climatic conditions in future agricultural activities, tuber crops have immense potential in ensuring food security in future. Moreover, promotion in regard to these products will ensure and promote agricultural activities in future.

References

1. Byju, G. (2025). Transforming tropical tuber crops: Scientific advances, emerging challenges and future directions for India. ICAR-Central Tuber Crops Research Institute.
2. Karri, V., & Nalluri, N. (2023). Enhancing resilience to climate change through prospective strategies for climate-resilient agriculture to improve crop yield and food security. *Plant Science Today*, 11(1), 21-33.
3. Kaushal, M. (2019). Climatic resilient agriculture for root, tuber, and banana crops using plant growth-promoting microbes. In *Climate change and agricultural ecosystems* (pp. 307-329). Woodhead Publishing.
4. Nedunchezhiyan, M., Pati, K., Chauhan, V. B. S., Gowda, K. H., Arutselvan, R., Suja, G., & Byju, G. (2023). Climate resilient technologies for sustainable production of root and tuber crops. *Journal of Root Crops*, 49(1), 3-10.