Drip fertigation

The method of nutrient application is also important in improving the nutrient use efficiency. Fertilizers applied directly to soil are generally not utilized efficiently by the crops. In fertigation, nutrients are applied through drip emitters directly into the zone of maximum root activity so as to achieve maximum yield.

Nutrient management for greater yam+maize intercropping is very vital to achieve higher yields. Drip fertigation of water-soluble fertilizers N-P_2O_5-K_2O @ 140-90-140 kg ha^{-1} to the greater yam+maize intercropping system is recommended for higher greater yam tubers and maize yield. Fertigation of N-P_2O_5-K_2O @ 140-90-140 kg ha^{-1} in 60 splits at 3 days interval (N-P_2O_5-K_2O 2.33-1.50-2.33 kg ha^{-1} $dose^{-1}$) is recommended for higher yield and nutrient use efficiency.

Advantages of drip fertigation

- Higher water and nutrient use efficiency
- Economy in water and nutrient use
- Lesser weed infestation
- Labour and energy saving

Challenges of drip fertigation

- Only water soluble (solid or liquid) fertilizers are suitable
- Periodical maintenance of the system is required
- Proper clean up is necessary against clogging
- High initial investments

Control of clogging in drip systems

Physical clogging: Mainly due to deposition of sand, silt or other suspended solids. An adequate filtration system can prevent physical clogging of drip irrigation system.

Chemical clogging: Mainly due to mineral precipitation of calcium, magnesium, iron or manganese. Acid injection, to lower irrigation water pH can reduce chemical clogging of drip emitters.

Biological clogging: Mainly due to bacteria, fungi or algae that can cause slime accumulation. Proper chlorination and disinfection procedures can control biological clogging of drip irrigation system.

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Drip feritgation in elephant foot yam

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DRIP FERTIGATION IN GREATER YAM+MAIZE INTERCROPPING SYSTEM

Introduction

Greater yam (*Dioscorea alata L.*) serves as a staple food in many countries in Africa, Asia and South as well as Latin America. It provides food and nutrition security to several millions of people in tropical region. The major production area of greater yam is the savannah region of West Africa, where world's more than 90% of the crop is grown, mainly in Nigeria. In India, it is mainly grown in Odisha, Andhra Pradesh and Kerala. Greater yam is a subsistence food crop in tribal and hilly areas and in other parts, it is a priced vegetable. Greater yam is rich in starch, various minerals and dietary fibre. Potassium content of greater yam is high and hence the tubers are suited for people having hypertension, but not for people suffering from renal failure. Tubers are also rich in dietary fibre which confers many health attributes to it. Pectin, hemicelluloses, cellulose and lignin contents in greater yam tubers are 2.6%, 3.4%, 1.6% and 1.1%, respectively and former three contribute towards dietary fibre in the tubers. In India, greater yam is consumed as vegetable. 'Dalmah' a very popular dish in Odisha, India prepared using yam as an ingredient.

Greater yam is normally grown in high rain-fall areas with distinct wet and dry seasons. It is relatively tolerant to drought. However, yield is affected if the crop faces moisture stress during initial stages of growth and tuber bulking phase. For uniform sprouting, greater yam should be irrigated immediately after planting. Greater yam is a 9-10 months duration crop. The crop requires irrigation where the monsoon period is 4-5 months. Once the monsoon rain starts, there is no need of irrigation. However, supplementary irrigation during prolonged dry spell is beneficial. The most common method of irrigation is surface irrigation to cope up with the deficiency of rains. Although it ensures uniform spreading which causes high evaporation and seepage losses.


Greater yam tubers

Greater yam being a trailing herb requires staking. Bamboo or wooden staking increases cost of yam cultivation. The un-staked plants are mostly devastated by anthracnose (*Colletotrichum gloeosporioides* Penz) disease. Maize (*Zea mays* L.) was found to be the best companion crop in greater yam cultivation under Indian conditions which reduces 60.0% of anthracnose incidence and increases greater yam yield by 26.3%. Intercultural operations such as surface irrigation and top dressing of fertilizers are very difficult due to huge canopy development after 3rd month in greater yam+maize intercropping system. Hence, drip irrigation and fertigation are the right options for water and nutrient management for greater yam+maize intercropping system.

Water requirement

Greater yam+maize intercropping system requires 815.3-896.3 mm of water for production of 38-40 tonnes of tuber equivalent yield per ha in a 9-10 months duration. Greater yam+maize intercropping system requires irrigation during pre and post monsoon period. As irrigation, 396.1-448.4 mm of water is required. The balance amount of water (419.2-447.9 mm) is received by the greater yam+maize intercropping system through rainfall in the form of effective rainfall.


Laterals and drippers layout along with mulching


Greater yam+maize intercropping system

Drip irrigation

Water is a scarce resource which needs to be preserved and the ultimate goal should be to ensure more crop per drop. Judicious and optimum use of water is highly critical for sustaining agricultural production. Drip irrigation is an efficient method of providing water directly in to the root zone of the plants. Irrigation efficiency in drip irrigation is as high as 90% compared to 30-50% in surface irrigation besides substantial saving of water to the extent of 40-80%. Schedule of irrigation by pan evaporation is an easy and inexpensive method and most widely adopted.

Application of 396.1-448.4 mm of water during dry period through drip irrigation at 100% of cumulative pan evaporation (CPE) during 1-90 days after planting (DAP) and at 80% of CPE during 91-270 DAP is recommended for greater yam+maize intercropping system for realizing higher yield, income and water use efficiency. Drip irrigation frequency can be fixed based on soil type. In sandy loam soil, drip irrigation at 3-4 days interval is found optimum whereas in clay loam soil 5-6 days interval. Greater yam+maize intercropping system requires 213-215 litre of water through drip irrigation for production of one kg of tuber equivalent yield. The water use efficiency (WUE) of drip irrigation of greater yam+maize intercropping system is 46.8-47.4 kg ha-mm^{-1} of water used.

Nutrient requirement

Major nutrients NPK are essential for crop growth and development. Greater yam being long duration crop requires more nutrients and maize is a heavy feeder of nutrients due to its high productivity. Hence, adequate supply of NPK is required for greater yam+maize intercropping system. It is recommended to apply water soluble fertilizers N-P_2O_5-K_2O @ 140-90-140 kg ha^{-1} to the greater yam+maize intercropping system for higher greater yam tuber and maize yield.

Fertilizer mixing tank


Venturi fertilizer injector system


Water filter unit

Nutrients automation


Sensor based control panel