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Hydroponic: Eco-Friendly and Sustainable Green Fodder

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SUMMARY

Hydroponics is gaining importance because of shrinking land size and increasing population. Hydroponics involves production of fodder without soil in a confined environment or nutrient rich solution in a greenhouse (hi-tech or low cost devices) for a short duration (approx. 7-8 days). The use of nutrient solution for the growth of the hydroponics fodder is not essential and only the tap water can be used. In India, maize grain should be the choice for production of hydroponics fodder. To produce one kg of fresh hydroponics maize fodder (7-8-days), about 1.50-3.0 litres of water is required. The hydroponics fodder is more palatable, digestible and nutritious while imparting other health benefits to the animals. It is recommended to supplement about 5-10 kg fresh hydroponics maize fodder per cow per day. Feeding of hydroponics fodder increases the digestibility of the nutrients of the ration which could contribute towards increase in milk production (8-13%). In situations, where conventional green fodder cannot be grown successfully, hydroponics fodder can be produced by the farmers for feeding their dairy animals using low cost devices.

INTRODUCTION

In India, livestock plays an important role for the nutritional se¬curity, particularly of the small and marginal farmers. The increase in the livestock population along with the intensive rearing system has resulted in the increase demands for feeds and fodder in the country. The feed scarcity has been the main limiting factor in improving the livestock productivity (Brithal and Jha, 2005). The land allocation for cultivation of green fodder is limited to only 5 per cent of the gross cropped area; but by 2020, India would require a total 526, 855 and 56 million tons of dry matter, green fodder and concentrates (Dikshit and Britha, 2010). Green fodder plays major role in feed of milch animals, thereby providing required nutrients for milk production and health of the dairy animals. Green fodder constitutes 13 to 35 per cent of the total input cost out of total feed cost is about 70 to 75 per cent, of the total cost (Ramteke et al., 2019). Rapid urbanisation and mining areas has caused shrinkage of grazing and fodder producing lands. Due to non-availability of quality green fodder throughout the year, milk producers are forced to utilise extra concentrates for optimum milk production. Fodder production cannot easily be increased due mainly to ever increasing human pressure on land for production of cereal grains, oil seeds and pulses. To meet this increasing demand for green fodder, one of the alternatives is hydroponic fodder to supplement the meagre pasture resources. Due to the above constraints the hydroponics technology is coming up as an alternative to grow fodder for farm animals (Naik et al., 2011; Naik, 2012; Naik et al., 2013). Fur¬ther, hydroponics technology for fodder production will be very effective for rearing dairy animals.

Definition of Hydroponic

The word hy droponics has been derived from the Greek word, “Hydros” meaning ‘water’ and “Ponic” meaning ‘working’. Hydroponics is a technique in which growing of plants/crops in water without any soil, generally in controlled conditions/environment. Water and plant nutrients are essential for plant growth which is incorporated

Procedure for Hydroponic Green Fodder Production

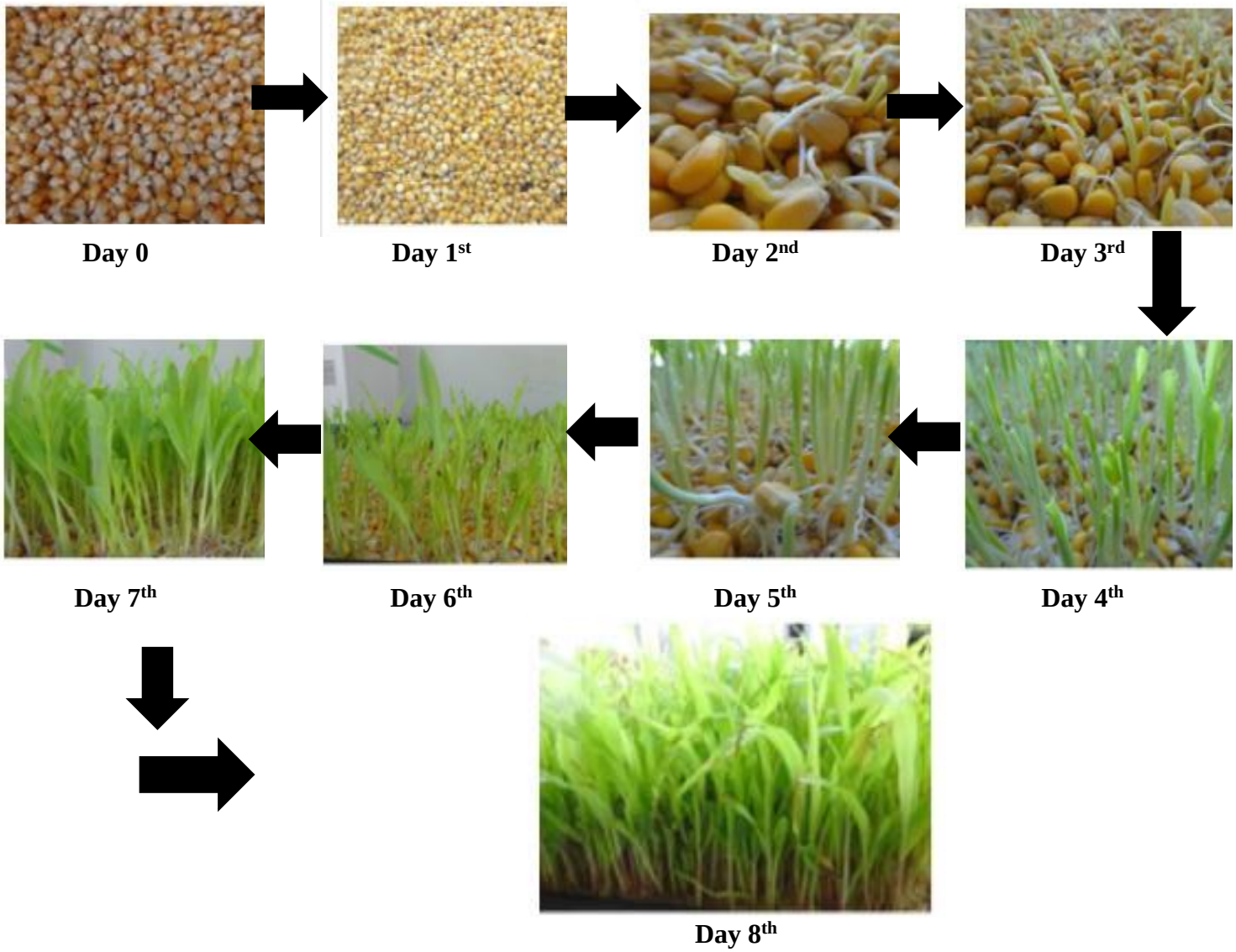
Green fodder by hydroponic can be grow by all coarse seed *i.e.* maize sorghum, cowpea horse gram, etc. But this seeds should be pesticide and impurity free and are of best quality. However, maize seed is the best for hydroponic green fodder production.

The Following Steps we can Use for Green Fodder Production

- Soaking of seed

- Germination of seed
- Transfer the seed in greenhouse
- Irrigation
- Complete growth of green fodder

Growth Stages of Hydroponic Maize Fodder



Need of Hydroponics Technology in Livestock.

Hydroponics technology is required to overcome following constraints during conventional green fodder production.

- Small land holdings amongst dairy farmers.
- Non availability of fertile land for fodder production.
- Irrigation, fencing, land preparations resources are limited.
- Mining and coastal belt has limited area for fodder production.
- Destruction of fodder by stray cattle's and wild animals.
- Higher cost of labour for cultivation practices.
- Poor participation of educated unemployed youths for fodder farming.
- Demand of green fodder is very high against existing availability of the fodder.

Advantages of Hydroponics

- **Nutritional advantages:** The green fodder from hydroponics is highly palatable, easily digestive and of better quality as compared to traditional fodder production. In comparison to conventional green fodders, hydroponics green fodder contains more crude protein (13.6% v/s 10.7%) and less crude fibre (14.1% v/s 25.9 %) as compared to traditional fodder production.
- **Conservation of water:** It requires just 2 to 3 litres of water to produce one kg of lush green fodder, as compared to 60 to 80 litters to conventional system of fodder production.
- **Land:** Hydroponics greenhouse requires marginal land to erect the system *i.e.* 10x4.5 meters land for 600 to 650 kg green fodder/day/unit in comparison to one hectare land for conventional green grass field.
- **Reduced labour requirement:** In conventional fodder production requires continuous intense labour for cultivation to harvesting of the grass but in hydroponics labour required is 2 to 3 hours/day only.
- **Reduction in growth time of green fodder:** To obtain nutritious fodder requires just over 7 days from seed germination to fully grown plant of 25 to 30 cm height. Biomass conversion ratio is as high as 7-8 times to traditional fodder grown for 60 to 80 days.
- **Green fodder round the year:** Hydroponic is capable to make provision for the green fodder round the year, as per demand.
- **Increasing of nutritive value of fodder:** Through hydroponics it is possible to enhance the nutritive value by adding additional growth promoters, nutrients, *etc*. to have quality milk from the dairy animals.
- **Organic/Natural feed for animals:** Growing of green fodder through hydroponics is completely by natural source. No pesticides are used in green fodder production that could produce organic green fodder.
- **Enhancement of milk production:** By providing green fodder to milch animals it can compensate the concentrate feed so as to have economically viable milk producing industry.
- **Minimising loss of fodder:** Green fodder produced from hydroponics will be fully utilised as there won't 'be loss of the fodder during feeding as compared to wastages of chopped traditional grasses during consumption by the animal.

Chemical Composition of Maize Green Fodder and Hydroponics Fodder (DM basis)

Nutrients	Conventional green fodder (Maize)	Hydroponics green fodder (Maize)	*Hydroponic green fodder (Barley)	Hydroponic green fodder (Jawar)
Protein	10.67	13.57	13.89	17.46
EE	2.27	3.49	3.60	3.02
CF	25.92	14.07	14.20	23.26
NFE	51.78	66.72	35.30	42.02
Ash	9.36	3.84	4.10	3.65
AIA	1.40	0.33	-	0.13

* Gebremedhin *et al.* (2015).

CONCLUSION

Hydroponics fodder is nutritious, palatable and digestible and can be grown in low cost techniques with locally home grown grains. Against impeding climate change and less availability land hydroponics fodder production is an effective alternative technology for sustainable

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