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Studies on performance of fodder crops in problematic soils and water

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Abstract
A field experiment was conducted to study the performance of fodder crops in problematic soils at farmer's field at Bhavanamvari Palem village during spring season 2017-18. The experiment was conducted in randomized block design which replicated thrice. The treatments were fodder crops like cowpea, stylo, hedge lucerne, alfalfa, CoFS-29, panthchari-6, and sweet Sudan grass. The initial soil having pH 8.5, EC 0.9 dS m^{-1} and SAR meq^{-1}. The bore well water having salinity of 7.1 is used for irrigation. The results showed that out of seven fodder crops tested, sweet sudan grass recorded the maximum biomass yield of 44.8 t/ha followed by CoFS-29 (40.1 t/ha) and Panthchari-6 (38.6 t/ha) where as the lowest biomass yield was recorded with stylo 5.3 t/ha respectively.

Keywords: Sweet Sudan grass, problematic soil, panthchari-6, green fodder

Introduction
Animal husbandry is an important component of farming system in India. Farmers engage in rearing of animals, often as a subsidiary activity, for the supply of milk, meat, wool and manure, or for using them as work animals. The shortage in dry fodder is 21.8% compared with requirement of 560 million tons for the current livestock population (Anonymous, 2006). Low supply of green fodder is one of the main reasons for low milk yield along with other factors like imbalanced nutrition, good quality fodder (Anonymous, 2009). Deficiency in feed and fodder has been identified as one of the major components in achieving the desired level of livestock production. In India, due to increased population pressure and competition from the food crops for natural resources like land, water, sunlight *etc*., therefore it is not possible to increase the area under fodder crops further. The only way to bridge the large gap between demand and supply of fodder is through maximizing the fodder production per unit area and unit time and strategies to develop and adopt dual type grain-cum-fodder crop varieties to cater the demand of grain and fodder with available land resource.
In coastal areas farmers are mostly cultivate low yielding, traditional rice varieties during wet season. Most of the land remains fallow in the dry season because of soil salinity, lack of good quality irrigation water and poor draining condition of the field (Karim *et al*., 1990) [8]. The major constraints to dairy cattle production is high cost of feed and shortage of fodder. Both soil and water salinity adversely affected the plant growth and development by these conditions is unsuitable for crop cultivation as like as livestock feeds and fodder. The scope of livestock rearing is limited due to the shortage of fodder field. In this situation in coastal areas peoples have been using virgin land and water for shrimp production and increasing salinity in surrounding areas and reduce the cultivated crop area and fodder growing area for livestock. The grazing land is decreased day by day. The shortage of fodder in the coastal areas of India, often affect livestock production and productivity, needs immediate attention, especially, in searching of salt tolerant fodder crops. Farmers either can use salt tolerant fodder species or can grow plant irrigating with available fresh water mixing with saline water to increase livestock productivity. The objective of the present study was to see the growth of fodder crops irrigated with poor quality water under problematic soils.

Materials and Methods
A field experiment was conducted at farmer's field at Bhavanamvari Palem village during spring season, 2017-18. The experiment was carried out in randomized block design with three replications. The treatments were fodder crops like cowpea, stylo, hedge lucerne, alfalfa, CoFS-29, panthchari-6, and sweet Sudan grass.

The initial soil having pH of 8.5, EC 0.9 dSm^{-1} and SAR meq^{-1}. The bore well water having salinity of 7.1 is used for irrigation. Nitrogen, phosphorus and potassium were applied through urea, single super phosphate and murate of potash, respectively. All other agronomic management practices were followed as per recommendation. The data were collected on five randomly selected plants in each plot and the data were subjected for statistical analysis.

Results and Discussion

Results revealed that salinity concentration had a significant effect on germination %, plant height (cm), dry matter yield (kg/ha) and plant biomass yield (kg/ha). Increasing sodicity levels decreased all plant growth and yield attributing parameters. Data revealed that 100 percent germination and establishment percent was recorded with panthchari-6, CoFS-29 and sweet Sudan grass followed by cowpea and the lowest establishment percent was recorded with stylo, hedge Lucerne and Alfa Alfa fodder crops. These findings are in agreement with other works (El Naim *et al*., 2012, Haghighat *et al*., 2012) [4, 5] reported on sorghum crop.

Data presented in table-1 represented the plant height was significantly influenced by different fodder crops in problem soils. Among the fodder crops the maximum plant height was recorded with sweet sudan grass (250 cm) which was significantly superior to hedge lucerne, cowpea and stylo where as on par with panthchari 6 (220 cm) followed by alfa-alfa (200 cm) and CoFS-29 (192 cm). Increasing salinity and sodicity levels decreased sorghum growth which is directly related to the amount of absorbed water by the roots and the toxic effects of Na^+ at high salt concentrations might have caused physical damage to roots thereby decreasing their ability to absorb water and nutrient, which may resulted in poor growth (Iqbal *et al*., 2000) [7].

From the investigation, it was found that among the seven fodder crops sweet Sudan grass produced highest drymatter yield and the lowest drymatter yield was recorded with alfa-alfa. It was reported that salinity decreased leaf area of sorghum (Bashir *et al.,* 2011) [3]. Sadeghi & Shourijeh (2012) [10] measured the number of leaves and found that the number of leaves was decreased with salinity increases.

The same trend was followed in biomass yield of different fodder crops. Significantly the highest biomass yield was recorded with sweet Sudan grass followed by panthachri-6 where as the lowest biomass yield was observed with stylo fodder crop. Excess of salt in growth medium restricts the availability of water to plant. This restriction causes in dehydration of cytoplasm which in turn affects the metabolism of the cells and ultimately reduces the growth of plant. Salts in soil and water can reduce water availability to crops at all stages of plant development and affect physiological and biochemical processes via ion toxicity, osmotic stress and mineral deficiencies to such an extent that yields can be affected (Hasegawa *et al*., 2000; Munns, 2002) [6, 9].

Table 1: Influence of soil salinity on Biomass yield of different fodder crops.

Treatments	Germination %	Establishment %	Plant height (cm)	Biomass yield (t/ha)
T1-Cow pea	92	95	130	20.4
T2-Stylo	87	90	120	5.3
T3-Hedge lucerne	91	90	110	25.7
T4-Alfalfa	90	90	135	33.0
T5-Panthchari-6	100	100	220	38.6
T6-CoFS-29	100	100	192	40.1
T7-Sweet sudan grass	100	100	250	44.8
SEm+	43	37	183	25
CD(0.05)	14	12	60	8
CV (%)	6.5	7.2	8.3	7.9

Fig 1: Field view of fodder crops at Bhavanamvari Palem

Conclusion

The Results Of The Present Study Revealed That The Growth Of The Fodder Crops Were Harmfully Affected By The Irrigation Water Salinity At Higher Salt Concentrations And With Soil Alkalinity. It Was Found That The Plant Height And Plant Biomass Yield Was Significantly Decreased When The Plants Were Grown Irrigating With Water Containing High Ec And Soil Alkalinity. Moreover, It Was Found That The Fodder Crop Growth And Yield Was Seriously Affected By Problematic Soil And Water. Data Revealed That Sweet Sudan Grass Recorded Highest Biomass Yield Followed By Cofs-6 And Panthchari-6 Fodder Crop.

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