VETIVER: AN ECO-FRIENDLY GRASS FOR THE MIDDLE EAST

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ABSTRACT

A research project, unique of its nature in the middle east, was under taken to find out the adaptability of Vetiver grass (*Vetiveria zizanioides* L Nash) now renamed as *Chrysopogon zizanioides* L Roberty) under extreme climatic variations, such as prolonged summer for seven months, short winter for five months, extreme temperature variations from 4°c to 55°c, high soil salinity ranging from 3000 ppm to 8000 ppm and pH ranging from 6.5 to 8.5 prevailing in Kuwait.

The experiment was conducted in sandy loam soils with five Vetiver cultivars as treatments, replicated four times and analyzed using Completely Randomised Design. The five Vetiver cultivars were sourced from Kerala, South India (including Madupatty, Pannimade and Uralikal). Mature tillers from Vetiver clump were used for planting. Each slip was dipped in cow dung slurry before planting. The slip so planted during the on set of winter in Kuwait had a minimum of two tillers. The slips were planted at a spacing of 60 x 75 cm. Due to the low temperature that prevailed at the time of planting, the top shoots died back. However its under ground growing points survived and resumed growth after four months when weather became warm and favorable.

The irrigation was given through drip irrigation system for 10 minutes daily during summer months. Third stage treated waste water having a pH 6.5-7.5 and EC 1100-2200 Mmhos/cm (uS/cm), nitrogen 10 to 20 ppm, phosphorus 0.5 to 10 ppm was used for irrigation. Organic manure in the form of Avicumis was applied @ 5 t/ha. Phosphorus and Potash @ 22.5 kg/ha each were given through irrigation water.

The grass attained full maturity nine months after planting. A maximum height of 160 cm was recorded by all the five varieties. No significant difference was noticed in the length of root. The roots had gone down to a depth of 1.5 meter. A maximum of 315 to 340 tillers per clump of the grass was observed. No pests and diseases were detected during the growth stage.

The experiment data revealed that all the five varieties performed well under Kuwait weather condition despite the adverse climatic conditions that prevailed over here. Additional information about the ability of the grass in preventing soil erosion was also noticed. Further experiments have to be conducted with this "wonder grass" for environmental protection and management of natural disasters like sand dunes.

Keywords: Kuwait extreme climatic variations, high soil salinity, and high pH

1. INTRODUCTION

Kuwait is a small country with a surface area of 17818 km^2 located at the head of the Arabian Gulf. There are 12479 km^2 of sandy desert and desertified lands in Kuwait. The low lying desert land is mainly sandy and barren. Due to scarce water resources and harsh climatic conditions, the total cultivated area is limited to 10730 ha out of a total cultivable area about 143000 ha. The two major agricultural areas in this country are Al Wafra that borders with Saudi Arabia in the south and Al Abdali that borders with Iraq in the north.

Kuwait receives about 141.2 mm rainfall per year and it falls from October to April. Sudden cloudbursts are common from October to April. It usually brings inordinate amounts of rain which can damage the crops in the open field. More over the rain water will not easily percolate down due to the hard Gatch layer lying at various depths of 1.5 m to 3 m at different places causing soil and water erosion. Sand storms and dust storms occur throughout the year, but are most common between March and August which in turn damages the cooling systems of Green houses due to sedimentation. Table 1.

Table 1. Basic condition of the experiment site at Al Rabiya

Max.Temp	Mini.Temp	Average Annual Rainfall	Soil texture	pH
54^0C	4^0C	141.2 mm	Sandy loam	7.5

Org. Matter(%)	N (%)	P (ppm)	K (ppm)
1.190	0.075	77.3	150.93

Hence, desertification and soil erosion are the hazards that need to be controlled and checked. Experimental findings in various countries proved that Vetiver grass can be very effective in controlling these hazards. Now Vetiver grass technology is effectively used in sand fixing at beaches and river banks for highway embankment protection. However, the adaptability of this pioneer grass in tropical areas like Kuwait has not been established so far. Therefore an experiment was launched in Public Authority of Agriculture Affairs and Fish Resources, the main institution responsible for Agriculture development in Kuwait.

2. MATERIALS AND METHODS

The experiment was laid out at Al Rabiya Kuwait in November 2006 where the soil is sandy loam in nature. Basic condition of the experiment site is furnished in Table.1. Five Vetiver cultivars from Kerala, south India, made available by Mr. R.C. Suresh of Golden Fries Ltd Coimbatore were used as treatments. The maximum and minimum temperatures during the cropping period up to October were 54^0C and 4^oC respectively as shown in Table 2. The experiment was laid out in Completely Randomized Design with five treatments and four replications. Mature tillers from Vetiver clump were used for planting. Each slip was dipped in cow dung slurry before planting. The slip so planted during the onset of winter in Kuwait had a minimum of two tillers. The slips were planted at a spacing of 60 x 75 cm.

The planting was irrigated with the drip system for 10 minutes daily during summer months. Tertiary stage treated wastewater, having a pH 6.5-7.5, EC 1100-2200 Mmhos/cm (uS/cm), nitrogen 10 to 20 ppm and phosphorus 0.5 to 10 ppm was used for irrigation. Organic manure in the form of Avicumis was applied @5t/ha. Phosphorus and Potash @ 22.5 Kg/ha each was given through irrigation water. Table 2.

Table 2. Maximum and minimum temperature and humidity during the cropping period

Period	Maximum Temperature (^{o}C)	Minimum Temperature (^{o}C)	Humidity (%)
November	26.6	13.9	78
December	19.6	4.1	88
January	18.4	4.0	94
February	22.0	9.6	80
March	27.5	15.2	55
April	32.7	19.7	61
May	39.0	26.3	42
June	44.3	28.8	26
July	54	30.1	37
August	46.5	30.5	29
September	43.7	27.7	46
October	37.6	21.5	58

3. RESULTS AND DISCUSSION

Due to the low temperature that prevailed at the time of planting the top shoots died back. However its underground growing points survived and resumed growth after four months when weather became warm and favorable. Cheng *et al* (1994) pointed out that Vetiver grass started to grow when daily mean temperature reached 10-15^{0}C or higher, and entered fast growing period at 20-30^{0}C or more. The Vetiver grass grew normally on sandy loam soils of Kuwait. In coastal areas the grass can tolerate and grow well on saline land affected by sea water (Zhang, 1998).The grass

attained full maturity nine months after planting. All the five varieties tried attained a height of 160 cm above ground level. However, they appeared a little poorer in their later growth phase with red tips in their leaves. This might be related to P and Fe deficiency. No significant difference in the length of root was observed. The roots had extended up to a depth of 1.5 m forming very good ground coverage. Flowering started 8 to 9 months after planting. The fresh weight of the green leaves per clump was 13 kg and the roots 4 kg. A maximum of 300 to 400 tillers per clump of the grass were noticed eleven months after planting. But the peak tillering was observed in August-September months. No pests and diseases were detected during the entire growth stage.

The grass established well within a short span of nine months on sandy loam soils under extremely adverse conditions. The present experiment confirmed that Vetiver is really a wonder grass which can grow well in subtropical deserts with very little nutrients, attaining a height of 160 cm, producing tillers as many as 320 slips/clump and rooting to a depth of 150 cm in just one growing season after planting. Table 3.

Table 3. Vetiver growth at different months

Month	**State of Growth**	**Survival Rate**	**Average Plant Height (cm)**	**Root Depth (cm)**
November	Planted			
December	Dormant			
January	Dormant			
February	Dormant			
March	Turned green	92%	30	
April			40	30
May			70	50
June			101	80
July			131	105
August			146	128
September			155	140
October			160	150

4. CONCLUSION

The experimental findings revealed that the only limiting factor in the Vetiver growth might be the lack of nutrients especially phosphorus and iron which made the Vetiver leaf tips withered and red. Research elsewhere, for example in India, shows that Vetiver grasses with their developed root system and vigorous growth could be used to prevent soil and water erosion effectively. However in this desert area a lot of research and demonstrations are required to find out the effectiveness.

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6. REFERENCES

Cheng,K.,Hu,G.Q., Rao,H.M., Xu, L.H.,and Wu, H.Q., 1994 Ecological effects of planting vetiver grass in citrus groves on slopping red soil fields. Acta Ecologica sinice 14(3):21-25

Zhang,J.1998 Vetiver grass planted on the Aeolian sands of Pingtan Islands and its application. In: Liyu Xu (ed) Vetiver Research and development. pp179-191. China Agricultural Science Tech Press, Beijing