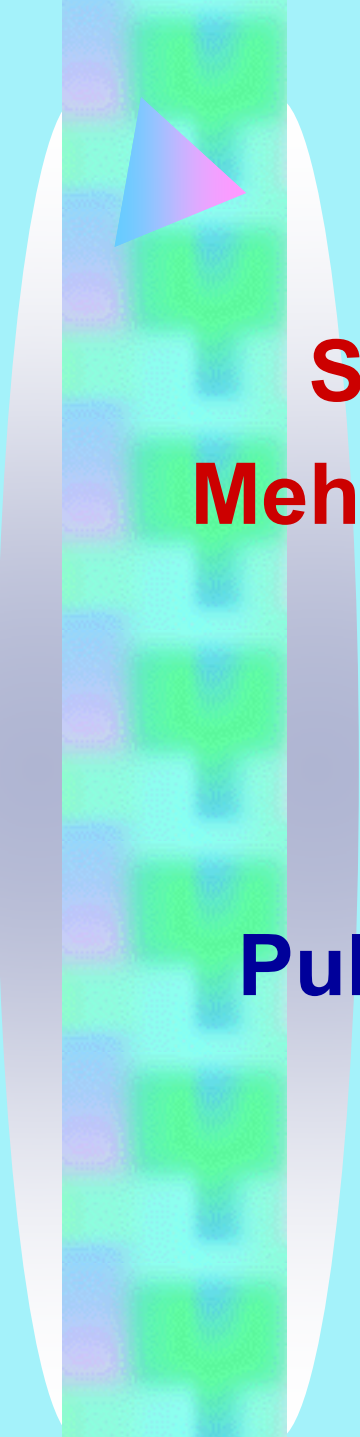




# **VETIVER**

**AN ECO- FRIENDLY GRASS FOR**

**THE MIDDLE EAST**



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# Public Authority Of Agriculture And Fish Resources



# **Kuwait**

- ◆ **Kuwait is a small country with a surface area of 17818 km<sup>2</sup> located at the head of the Arabian Gulf.**
- ◆ **There are 12479 km<sup>2</sup> 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.**

# Climate

- **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.**



## **Agricultural Areas**

**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.**



# Objective

- ◆ **Desertification and soil erosion are the hazards that need to be checked in Kuwait.**
- ◆ **Experimental findings in various countries proved that vetiver grass can be very effective in controlling these hazards.**
- ◆ **Vetiver grass technology is effectively used in sand fixing in beaches and riverbanks for highway embankment protection.**
- ◆ **The adaptability of this pioneer grass in Kuwait has not been established so far.**
- ◆ **So this experiment was launched at Public Authority of Agriculture and Fish Resources the main institution responsible for agricultural development in Kuwait.**



# Materials and Methods

<b>Location</b>	<b>:Al Rabiya</b>
<b>Soil</b>	<b>:Sandy loam</b>
<b>Max Temperature</b>	<b>:54<sup>0</sup>C</b>
<b>Min Temperature</b>	<b>:4<sup>0</sup>C</b>
<b>Annual Rainfall</b>	<b>:141.2mm</b>
<b>pH</b>	<b>:7.5</b>
<b>Organic matter(%)</b>	<b>:1.190</b>
<b>Nitrogen(%)</b>	<b>:0.075</b>
<b>Phosphorus (ppm)</b>	<b>:77.3</b>
<b>Potassium (ppm)</b>	<b>:150.93</b>



# **Planting**

**Design**

**: Completely  
Randomised Design**

**Treatments**

**: 5 varieties**

**Replication**

**: 4**

**Spacing**

**: 60x75cm**

**Planting date**

**: November 2006**

**Planting material**

**: Mature slips dipped  
in cow dung slurry  
with two tillers/ hill**

## Maximum and minimum temperature and humidity during the cropping period

<b>Period</b>	<b>Maximum Temperature (°C)</b>	<b>Minimum Temperature (°C)</b>	<b>Humidity (%)</b>
<b>November</b>	<b>26.6</b>	<b>13.9</b>	<b>78</b>
<b>December</b>	<b>19.6</b>	<b>4.1</b>	<b>88</b>
<b>January</b>	<b>18.4</b>	<b>4.0</b>	<b>94</b>
<b>February</b>	<b>22.0</b>	<b>9.6</b>	<b>80</b>
<b>March</b>	<b>27.5</b>	<b>15.2</b>	<b>55</b>
<b>April</b>	<b>32.7</b>	<b>19.7</b>	<b>61</b>
<b>May</b>	<b>39.0</b>	<b>26.3</b>	<b>42</b>
<b>June</b>	<b>44.3</b>	<b>28.8</b>	<b>26</b>
<b>July</b>	<b>54.0</b>	<b>30.1</b>	<b>37</b>
<b>August</b>	<b>46.5</b>	<b>30.5</b>	<b>29</b>
<b>September</b>	<b>43.7</b>	<b>27.7</b>	<b>46</b>
<b>October</b>	<b>37.6</b>	<b>21.5</b>	<b>58</b>

# Irrigation

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



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**General view of Vetiver slips planted**



18.8 12

# Vetiver Clump

## Results and Discussions

- **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.**
- **The Vetiver grass grew normally on sandy loam soils of Kuwait.**
- **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.**

◆ **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.**





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# Vetiver Slips



21 835

Vetiver Slips started Growing



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**View of vetiver plot in Rabiya**

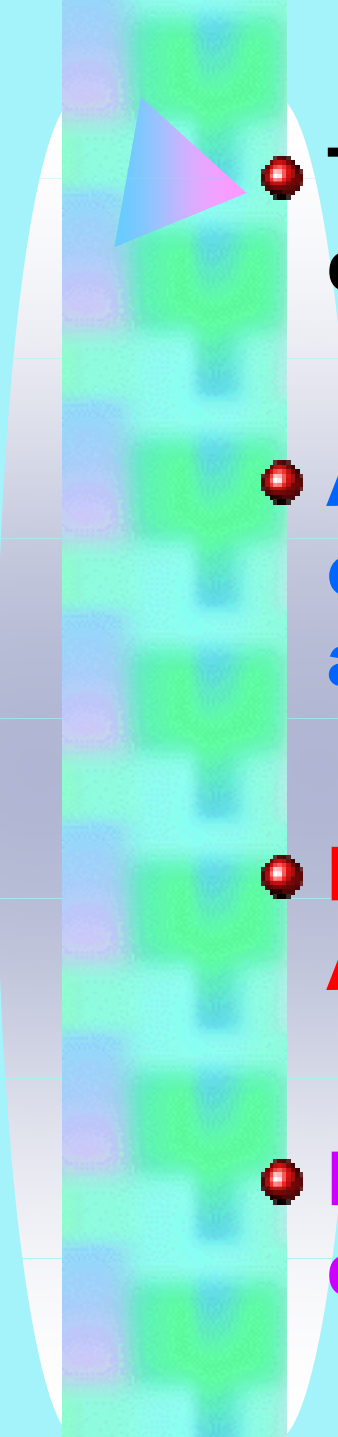


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**Vetiver in active growing stage**

# Vetiver Growth at Different Months

Month	Date of turning Green	Survival rate	Average plant height (cm)	Root Distribution (cm)
November	Planted			
December				
January				
February				
March	Turned Green	92%	30	
April			40	30
May			70	40
June			101	80
July			131	105
August			146	128
September			155	140
October			160	150



- **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.**



**Roots of vetiver**

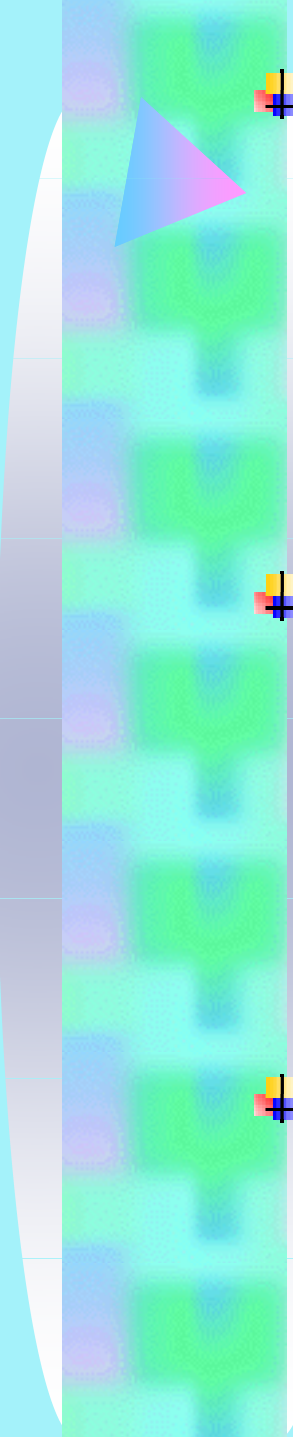
# Conclusion

- ✚ 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.





***Vetiver in Flowering stage***

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- +** 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.



**Thank You**

15:08