CULTIVATION OF *CHLORIS GAYANA* CV: PIONEER ON SALINE WATER UNDER HYPER ARID CLIMATE

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Summary

Cultivation of *Chloris gayana,* Kunth., cv: Pioneer as a pasture species was undertaken in the United Arab Emirates in 1981 for the first time from the seed stock imported from Australia. The purpose was to provide fodder for the rapidly developing livestock population of the country. In the begining an area of 200 hectares was brought under a crop of Pioneer Rhodes grass on sprinkler system of irrigation. The irrigation water of these sites was drawn from the subsoil and it contained 3500 ppm of dissolved salts. This project went into full production within three months of its initiation. Thereafter this programme was extended further over an area of about 2000 hectares under various agencies. The Forestry Department, besides raising pastures on project scale, also initiated a study to test the adaptability of Pioneer Rhodes grass to irrigation water having higher levels of salinity. The study was laid on various soil types available in the region. Observations on the response of Pioneer Rhods grass to various soil and water quality classes were recorded for two years. During this period a total of nine harvests were obtained from the experimental sites. The germination percent and yield of grass were correlated with various soil and water parameters. It was found that the germination practically ended when the irrigation water contained 60000 ppm of dissolved salts. The yield of dry matter gradually decreased with the increase in salt contents of water. It was also inferred that where germination of Pioneer Rhodes grass failed, a successful crop could be established by tuft planting on flood irrigation with water containing upto 15000 ppm of dissolved salts.

Study Area

The eastern region of the Emirate of Abu Dhabi is situated between 24 to 25 degrees north latitude and 54 to 55 degrees east longitude. It constitutes south eastern portion of the United Arab Emirates. This region is bound by the Omani mountains on the eastern side and by vast mobile sandy wastes, interspersed with out-wash plains running in an east west direction, on the remaining three sides. Ninety five percent of this region is comprised of mobile sand dunes. The remaining area is covered by Mount Haffit and its out-wash valleys. Map 1 shows the location and other salient features of this region.

. The climate of the region has been classified as hyper arid. A small portion around Mount Haffit falls in the arid zone. The average annual rainfall in Al-Ain is 92 mm. February and March are the rainiest months. The mean daily temperature: for January and September are 17.7°C and 36.7°C respectively. The mean minimum temperature of January is 9.7°C and the mean maximum temperature for September is 40.9°C. Forests have never been recorded in this region. The range of sunshine varies from 65 to 95%. Relative humidity is 10% in June, which is minimum. The maximum relative humidity occurs in January and it is 81%.

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The main source of water supply in this region is its subsoil water reservoir. The quality of subsoil water is variable. It is potable in small area north and east of Mount Haffit, with TDS of less than 1000 ppm. The salt load increases as one moves away from Mount Haffit towards South and West. It reaches a level of about 25000 ppm near the western boundary of the region. The subsoil water in generally found at a depth of 5 to 15 meters. However it is found at 30 meters depth near Al Ain and in high lying areas.

The eastern region does not have well developed soils. A major part of the region contains mobile sand dunes, interspersed with out-wash valleys running in the east-west direction. These valleys as well as the area around Mount Haffit comprise of calcarious regoliths, underlain with conglomerates. Several valleys are water logged or infested with thick accumulation of alkali salts on the ground surface.

The main vegetation groups of this region are as under:

1. Submontanous Group Containing ***Acacia tortilis, Calotropis procera, Capparis cartliagins, Citrullus colocynthis, Euphorbia larica, Haloxylon salicornicum, inflata, Moringa perigrina, Pennisetum divisum.***

2. Sand dunes Group with ***Calligonum comosum, Cyperus conglomeratus Haloxylon salicornicum, Leptadenia pyrotechnica, Panicum turgidum, Pennisetum divisum*** and ***Prosopis cineraria.***

3. Salt plains group having ***Juncus regidus, Limonium stocksiii Sueda fruiticosa, Salsola schweinfurthii, Tamarix nilotica, and Zygophyllum mandavelli.***

Materials and Methods

The experiment was initiated in May, 1982. The experimental site were selected in such a way as to encompass as many soil and water quality classes as possible. Table 2 and 3 give the analysis of soil and water of these sites. Sewage compost was mixed with the soil in a ratio of 1.5 after levelling the sites. No chemical fertilizer was applied in the beginning of the experiment. A deep flood irrigation was given before sowing or tuft planting. The underlying conglomerate of the outwash done in a shallow occured, was not disturbed. In such a case, ploughing was done in a shallow layer. Sowing of Pioneer Rhodes grass was done in May 1982. The seeding rate was six kilograms per hectare. Sowing was done at a depth of one to two centimeters in closely made furrows. The furrows were closed with rakes after placing the seed. Flow irrigation was given again immediately after sowing. The germination beds were kept moist with daily irrigations thereafter. Tufts of Pioneer Rhodes grass were planted in plots where the seedlings had been killed by brackish water. The tufts were obtain from the nursery with as much of root volume as possible. The stock so obtained was transported and planted the same day when it was uprooted. The planting was done at a spacing of 30 x 30 centimeters. The experimental plots were irrigated daily with flood irrigation NPS compound fertilizer was given to all plots after the establishment of seedlings or the tufts at 200 kilograms per hectare per cropping cycle. The compound fertilizer used in this experiment had a ration of 4 : 1. This ratio was selected for these plots so that the deficiency of nitrogen and potassium in the soil was adequately compensated. The crop was harvested after every three months and its green and dry weight determined. Tuft planting showed that a spacing of 1x1 meter would also have been adequate as the vacant area in between the tufts was completely covered by the runners. The crops tufts original showed normal growth on irrigation with saline water containing salt load of upto 15000 ppm. However the yield of dry matter was dependent on the salt load of irrigation water. Graph 3 shows the effect of dissolved salts on the yield of Rhodes grass.

Results

Germination took place within eight days after sowing. However, the emerging seedlings were killed by brackish water. The *mortali* of seedlings was directly related to the TDS, and Cl and Na^+ contents of the irrigation water. The germination was 32% when the water contained 750 ppm of dissolved salts. As the salinity level increased to 6000 ppm or more, the survival percentage of the seedlings dropped to zero. Graph 5 shows the relationship between the TDS and the germination percentage. Tuft planting showed that a spacing of 1 x 1 meter would also have been adequate as the vacant area in between the tufts was completely covered by the runners. The crop of tufts origin showed normal growth on irrigation with saline water containing salt load of upto 15000 ppm. However, the yield of dry matter was dependent on the salt load of irrigation water. Graph 3 shows the effect of dissolved salts on the yield of Rhodes grass. Graph 3 and 4 show the weight of dry matter obtained in nine cuttings. This data shows that a close relationship exists between dry matter yield and the salt load of the irrigation water. Pioneer Rhodes grass is a verstile fodder species which is capable of yielding substantial quantity of feed under adverse environmental conditions. Its tolerance for salinity in irrigation water is far more than any other pasture species. As may be seen form Graph 3, there is a close relationship between the drymatter yield of Rhodes grass and the salt load of irrigation water. The average yield per harvest from the sweet water area comes to 46 tons per hectare. There is a gradual decline in yield as the salinity level increases, until it is 7 tons per hectare at EC of 34x10 mS/cm^3.

Pioneer Rhodes grass has a high tolerance level for the toxic cl^- and Na^+ ions. The relationship between SAR, Cl and Na contents of water and yield of grass is shown in Graph 4. It may be observed that a yield of about 5 tons per hectare per crop is obtained with irrigation water containing 300 meq/1 of Cl^- and 400 meq/1 of Na^+.

The results of this experiment are of significant importance for regions having limited sweet water resources, and abundant supply of brackish water. The deseret areas are generally suffering from shortage of fresh water. However, most deserts are underlain with huge brackish water reserviors. The techniques discussed in this note can be of great help in raising small fodder farms on flow irrigation for supplying supplementary feed to the livestock.

The establishment and subsequent survival of Rhodes grass on brackish water is largely dependent on good soil drainage. The crop can adversely be effected if the soil drainage is poor. No difficulty was encountered during this experiment in areas having deep sandy soils. However, artificial drainage had to be provided in order to keep the soil flushed of excess salts in cases of impeded drainage.

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