Pak. j. life soc. sci. (2008), 6(1): 37-41

Pakistan Journal of Life and Social Sciences

Pathogensstudies on The Success Rate of Datepalm and Eucalyptus on Saline Soil and Using Saline Water

Muhammad Latif, Ghulam Nabi and Shafiq Anwar[1]
Centre of Excellence in Water Resource Engineering, University of Engineering and Technology, Lahore-Pakistan
[1]Department of Structures and Environmental Engineering, University of Agriculture, Faisalabad, Pakistan

Abstract

This study was planned to investigate the utilization of different quality water for agriculture (silviculture) through participatory approach of the end users. Main objective of this study was to motivate the farmers by participatory approach to make best use of their less productive soil by using poor quality water for growing silviculture plants. The local community was involved in the study at all levels. This study was carried out at village Kangrah, tehsil Sahiwal of District Sargodha. The groundwater of marginal quality and sewerage water were applied to the experimental plots. Chemical analysis of the soil showed that soil was highly saline-sodic having heavy clay texture and poor drainage. Two treatments were done for soil and saline water was applied for irrigation. The vegetative data was collected to monitor the growth of the plants. The results showed that the Eucalyptus plants have average girth of 9.36 inch in treatment I, 9.68 inch in treatment-II and 9.04 inch in control. The average plants height for treatment-I, treatment-II and control were 20.88 ft, 20.13 ft and 21.04 ft respectively. In datepalm plants, the survival percentage in treatment-I, treatment-II and control was 73%. 79% and 83% respectively. The plant height varies from 3 ft to 7 ft in different treatments.

The growing of datepalm on saline soil was very much appreciated by the farmers community and this study served as demonstration site to the end users. A number of farmers showed keen interest in growing datepalm which is the real contribution of this study. However, the farmers may be facilitated and guided in getting suitable dateplam sukkers, which are not readily available in most of the area.

Corresponding author: Shafiq Anwar
[1]Department of Structures and Environmental Engineering , University of Agriculture, Faisalabad, Pakistan
E.mail: shafiq_anwar@hotmail.com

Key words: Datepalm and eucalyptus, Vegetative growth, Farm yard manure, Silt, Gypsum

Introduction

Pakistan is facing an acute problem of irrigation water shortage. Even exploiting of all good quality water resources, it may not be possible to bring all the areas of the country under cultivation. Therefore efforts should be made to use marginal to poor quality groundwater and drainage effluents wherever possible so that crop water requirements can be fulfilled. Moreover, a huge area of the country are not fit for cultivation of any agriculture plant due to excess of salts or rising groundwater . Keeping in view there facts, present study was initiated to observe the effects of marginal irrigation water and to find the possibility of cultivation of datepalm and eucalyptus on problem soils. According to standard criteria salinity (ECe) threshold in datepalm plants is 4 dS/m and at ECe 17.9 dS/m 50% reduction in yield has been observed (Maas, 1986).

The dateplam plants can successfully grow in arid and hot climate under saline environment. They can tolerate low temperature but neither grows below 10oC nor set and develop fruit until the temperature is above 25°C. At the time of fruiting the temperature should be high (45-50°C) and humidity should be lower (Qureshi and Barrett-Lennard, 1998). It has been reported that the irrigation canals seep at the rate of 0.21 m3/day square meter of the wetted area soil which causes rise in watertable. The seepage is a major cause for waterlogging and salinity (Ahmad and Chaudhry 1988). The development of economical and efficient methods to combat with waterlogging and salinity is of paramount importance in order to feed the exponentially increasing population of the country. This can be achieved either through hydrological engineering approaches along with the use of chemical amendments or biological reclamation of salt affected soils i.e., saline agriculture (Qureshi et al. 1993). The water quality standards used in Pakistan are very conservative. If proper management practices (e.g. leaching

fraction, amendments, soil types) are adopted, waters of poor quality can be used. This argument is also supported by the water quality standards suggested by Gupta (1990) for arid to semi-arid zones of India. Ahmed (1987) reported that eucalyptus can survive in nutrient solution with electrical conductivity upto 50 dS/m (under drained condtion) and upto 42 dS/m both in drained and water logged condition. Shukla and Misra (1993) tested efficiency of four eucalyptus species in saline soils. Initial soil pH was 10.1 to 10.5. There was Kanker pan at 0.5-1.5 m and groundwater at 4-5 m depth. Plant growth parameters were observed at different times. Trees were found effective in reducing the soil pH, salt contents, bulk density and exchangeable Ca. water holding capacity of the soil under plantation was also increased. Borges et al (1986) conducted an experiment to observe the effect of compact soil layers on the growth of eucalyptus seedlings. Compact layers of bulk densities of 0.85, 1.05, 1.25 or 1.35 g/cm3 were used to grow seedlings. There was no root growth into the layer of bulk density 1.25 g/cm3. Seedling shoot concentration of P and K decreased linearly with soil compactions, while Ca and Mg concentration remained unaffected.

Materials and Methods

Present study was carried out on the field of a farmer in village Jalalpur Kangra located on Sargodha-Jhang Road about 19 km from Sargodha city. Datepalm sukkers were purchased from experimental orchard of the University of Agriculture, Faisalabad. Some plants of eucalyptus were purchased from the forest department and were planted on the border line of the experimental plot to check its survival rate.

First of all the soil of the experimental area was analysed to find the concentration of various salts. Irrigation water of the tubewell was also analysed to determine its quality. Following treatments were used to observe their impact on soil improvement and survival of plants. A pit was made 2 feet diameter and 3 feet deep. In T1 treatment the pit was filled with Farm yard manure silt with ratio 1:1, whereas in T2 treatment the pit was filled with parent soil and Gypsum with ratio 1:1. In To treatment (control) pit was filled with the parent soil without any amendments.

To Control
T1 FYM + Silt
T2 Soil + Gypsum

Datepalm sukkers and eucalyptus seedlings were transplanted in the prepared field and following data were recorded:

Survival rate
Height of plant (ft)
Girth of plants (inches)
Length of leaves (inches)

Results

Before the initiation of experiment water and soil analysis were carried out to know the actual status of various constituents. Various standards used to compare the quality of water are given in Table 1, whereas analysis report of irrigation water is presented in Table 2. Similarly soil samples from all the experimental plots were taken at four different depths and each of them was analysed chemically as indicated in Table 3.

Datepalm sukkers were transplanted during April 2001. Soil as well as the water was not fit for datepalm cultivation, so the initial data were recorded on percent survival of the plant. Table 4 indicates the survival percentage and mortality of the plants. It is clear from the table that in To (control) out of 30 sukkers, 25 survived and 5 more found dead thus contributing 83% survival whereas in T1 and T2 the survival rate was found to be 73 and 78 percent, respectively. Overall, 88 sukkers were planted which showed 78% survival success and 19 of them were find killed and data were recorded 4 months after plantation.

Table 1. Water Quality Standards Used in Pakistan(WAPDA, 1981).

	EC(dS/m)	SAR	RSC
Usable	Less than 1.5	Less than 10	Less than 2.5
Marginal	1.5 –3.0	10 – 18	2.5 – 5
Hazardous	more than 3	more than 18	more than 5

Table 2. Chemical Analysis of Water from Different Sources.

Sr. No.	Water Source	EC_{25} (dS/m)	PH	SAR	RSC (me/l)
1.	Drain	14.01	9.1	22.02	-
2.	Hand Pump	2.37	9.5	5.16	1.6
3.	Tubewell	2.25	9.8	5.54	-

Table 3. Chemical Analysis of Soil Samples of Selected Sites.

Sr.#	Soil Depth (cm)	EC (dS/m)	pH	Ca+Mg (meq/l)	CO_3 (meq/l)	HCO_3 (meq/l)	Cl (meq/l)	Na (meq/l)	K (meq/l)	SAR	RSC (meq/l)
PLOT – A											
1	0 - 15	27.94	9.4	15.8	-	6	75	185	10	65.82	
2	16-30	20.00	9.5	13.8	-	8	45	120	5	45.68	NIL
3	31-60	18.48	9.5	13.0	-	6	41	112.5	5	44.12	
4	61-90	22.10	9.5	15.0	-	8	56	135	7.5	49.29	
PLOT - B1											
5	0 - 15	21.66	9.4	14.6	-	8	68	135.0	5.00	49.96	
6	16-30	17.14	9.1	11.6	-	10	49	107.5	3.75	44.43	
7	31-60	14.11	9.2	8.0	-	10	32	87.5	3.75	43.75	NIL
8	61-90	12.47	9.2	8.8	-	10	26	80.0	3.75	38.14	
PLOT - B2											
9	0 - 15	22.42	9.5	26.0	-	8	67	160.0	7.5	44.38	
10	16-30	15.61	9.7	12.0	-	12	44	45.0	5.0	18.37	
11	31-60	11.83	9.8	4.8	-	12	29	80.0	3.75	51.64	NIL
12	61-90	11.23	9.8	4.0	-	14	27	77.5	3.75	54.80	
PLOT – C											
13	0 - 15	6.17	9.6	8.0	-	10	20	40.0	2.5	20.00	
14	16-30	5.64	9.7	5.6	-	12	15	35.5	2.5	20.91	NIL
15	31-60	4.67	9.7	4.2	-	8	14	27.5	1.25	18.98	
16	61-90	5.52	9.6	7.2	-	12	20	32.5	1.25	19.56	

Table 4. Establishment of Date Palm Plants for Difference Treatments.

Treatment	Total No. of plants planted	Plants survived	Plants dead	Percentage survival (%)
T1	30	22	8	73
T2	28	22	6	78
T0	30	25	5	83

Height of survived datepalm plants was also noted at this time. Table 5 reveals the variable heights of different groups of plants within the same treatment as well as different treatments. Keeping in view the health and vigour of plants the maximum number of plants (10) of plant height (45 cm) was noted in T_1. This was followed by T_2 and control in which the number of plants of this height were found to be 9 and 7, respectively.

Table 5. Height of Date Palm Plants for Different Treatment (inches).

Treatment	No. of plants survived	No. of plants height upto 6″	No. of plants height 6-12″	No. of plants height more than 18″
T1	22	10	2	10
T2	22	4	10	9
T0	25	7	9	7

Eucalyptus seedlings after transplanting on the margin of the experimental plant were also studied for their vegetative growth 11 month after plantation. The data depicted in Table 6 indicates that maximum plant height (9.92 ft) was observed in T_2. Next in order was T_1 (9.16 ft) whereas lowest plant height (6.36 ft) was observed in control. The girth of plants, T_1 produced maximum stem girth (2.75″), this was followed by T_2 in which 2.54 inches stem girth was noted. Control was found at bottom with the stem girth of 1.96 inches.

Table 6. Vegetative Growth Characters of Eucalyptus, feet.

Treatment	Plant No.1	Plant No.2	Plant No.3	Plant No.4	Plant No.5	Plant No.6	Average Height
T1	11	12.5	9	5.4	10.5	6.6	9.16
T2	8.7	11.6	8.5	10.6	10	-	9.92
T0	5.25	5.5	8.53	5.6	4.2	9.1	6.36

Length of leaves were also studied in eucalyptus plants leaves of maximum length were produced in T_1 (7.41″). Next position was occupied by control in which average leaf length was 7.36 inches whereas T_2 got the intermediate position exhibiting 7.00 inches leaf length.

Discussion

At initial stage the farmers of the area were hesitating to cultivate datepalm plants due to unfavourable prevailing conditions of soil and water, yet the present study indicated that datepalm orchards can be made successful by adopting proper management practices. In spite of the reason that good water was not present on the selected site, the available marginal or poor quality water can be use after suitable treatments. Eucalyptus can also be used to grow on such problem soils but the (lack of) their marketing facilities are a great limitation. Hence datepalm should be adopted to grow datepalm orchards on large scale for the prosperity of the local poor people.

It has been found that rate of mortality of datepalm success is higher under such conditions but by manipulating some suitable techniques, their death rate can be minimized. This study should be continued to record the data on flowering and fruiting. At the same time, new areas should be brought under cultivation of datepalm success. It is hoped that with the passage of time, datepalm plants can be successful in future and vigorous datepalm orchards will be developed through this technique. In this way, most of the soils of this region which are not fit for sowing of any agricultural crops, can be brought into use economically for datepalm orchards and thus it will be a continuous source of income for the people of the area who have no other source of income. They depend only on the agriculture of their land. It is hoped that through this study, much development of the area will be possible which will help for the prosperity of the local people.

Conclusions

1. Utilization of poor quality water on problematic soil was the main focus of this study. Growing of kallar grass and Eucalyptus trees are well established practiced and the farmers are well aware of such measures. Not many farmers appreciate planting of Eucalyptus due to absence of its market or any other utilization. The land owner already grows kallar grass therefore it was not justified to repeat the practice which has been already adopted in the study area. Growing of date palm, Ber and Kekar trees was discussed with the farmer who appreciated the idea and ensured to take care of the plantings after the project will be over.
2. Some problems were initially faced to establish the datepalm plantings but now the condition of the experiment is satisfactory. About 78% plants are well growing ranging in height from one to five feet.
3. The idea of growing datepalm on saline and waterlogged soils was very much appreciated by the farming community. A number of farmers contacted the staff of the project and showed keen interest in growing the datepalm plants. They got information about growing the datepalm on saline soils. Some of them got the datepalm sukkers from the Datepalm Research Station, Jhang, and have grown the datepalm trees at their own. This is clear evidence of success of growing datepalm in the study area as demonstrated by the experimental site established under this study.
4. Eucalyptus trees are flourishing well and sewerage water has been applied to this field without any adverse affects on plant growth.

References

Ahmad, R. Saline Agriculture at Coastal Sandy Belt. Department of Botany, University of Karachi, 183 pp. 1987.

Ahmad, N and Chaudhry, G.R. Irrigated Agriculture of Pakistan, Shahzad Nazir, Lahore. 1988.

Borges, E.N., R.F. Novias de, NF. Barros de, L.M. Costa de and J.C.L. Neves. Response of Eucalyptus Seedlings to Compacted Soil Layers. Revista Arvore. 10(2): 181-195. 1986.

Gupta, I.C. Use of saline water in agriculture; A Study of Arid and Semi-Arid Zones of India. Oxford & IBH Publishing Company, New Delhi, India. 1990.

International Waterlogging and Salinity Research Institute (IWASRI). Publication No. 175.

Maas, E.V. Salt Tolerance of Plants. Applied Agricultural Research, 1, 12-26. 1986.

Qureshi, R.H., S.Nawaz and T. Mahmood. Performance of Selected Trees Species Under Saline-Sodic Field Condition in

Pakistan. In: H.lieth, and alMasoom (eds.). Towards the rational Use of High Salinity Tolerant Plants, Vol. 2:259-269. Kluwer Academic Publishers, Netherlands. 1993

Qureshi R.H. and E.G. Barrett-Lennard, A Hand Book: Saline Agriculture for Irrigated Land in Pakistan. Australian Centre for International Agricultural Research Cannberra, Australia. 1998.

Shukla, A.K. and P.N. Misra. Improvement of Sodic Soil Under Tree Cover. Indian Forester. 119(1): 43-52. 1993.

Water and Power Development Authority (WAPDA) Atlas Soil Salinity Survey and Research Organization Planning Division, WAPDA, Lahore. 1981.