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# EFFECT OF WATER AND SALT STRESS AS WELL AS ORGANIC MANURE ON SOME NATURAL RANGE PLANTS AT SOUTH SINAI

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## ABSTRACT

Four field experiments were carried out at Ras Sudr Research Station, Desert Research Center, at South Sinai Governorate, Egypt., during two successive growing seasons, i.e. 2008 and 2009 the aimed of this investigation was aimed to study the effect of three levels of salinity i.e. 3500 , 5500 and 7500 ppm, three rates of organic manure i.e. control, 10 and 20 $m^3$ / fad. well as study the effect of three irrigation interval i.e. 15, 30 and 45 days, three rates of organic manure i.e. control, 10 and 20 $m^3$ / fad. and their interaction on yield and chemical composition of *Ochradenous baccatus* and *Deverra tortuos* plants. Yield and chemical composition were taken at 6 (first cut), 12 (second cut), 18 (third cut) and 24 (fourth cut) months after transplanting.

**The results could be summarized as follows:**

1- Fresh and dry yields and crude protein % of *Ochradenous baccatus* and *Deverra tortuosa* were higher when grown under salinity concentration of 3500 ppm and 20 $m^3$/fad. while total carbohydrates and crude fiber % increased organic fertilization at a rate by increasing salinity level up to 7500 ppm under control organic manure 20 $m^3$ and, , at 6, 12, 18 and 24 months, respectively from transplanting.

2- Prolonging the irrigation interval from 15 to 45 days significantly depressed significantly fresh and dry yields and crude protein % and increased total carbohydrates and crude fiber % of two range plants. Increasing organic manure rates from 0 to 20 $m^3$ / fad. increased fresh and dry yields, crude protein and total carbohydrates and decreased crude fiber % of *Ochradenous baccatus* and *Deverra tortuosa* at all growing periods.

3- Highest value of fresh and dry yields and crude protein of both range plants was obtained when organic manure was added at the rate 20 $m^3$/fad at the low salinity level (3500 pp). While, the highest yield of fresh and dry as well as crude protein for both range plants was obtained when organic manure was added at a rate of 20 $m^3$/fad. at the narrow irrigation interval, (10 days) it could be summarized that to increase frash and dry yield of both two range plants by increasing the rate of organic manure up to 20$m^3$/ fed. At different salinity levels as well as at the different irrigation intervals.

**Keywords**: irrigation intervals, salinity, *Ochradenous baccatus*, *Deverra tortuosa*, yield, chemical composition, South Sinai.

## INTRODUCTION

Natural vegetation plays a main role as a fodder resource in the world for its importance to increase non-domestic animal productivity. Range species are very diverse in terms, plant systematic, biology and ecology as well as in their nutritive values. They include annual and perennial herbaceous species as well as shrubs and trees (Le Houerou, 1994).

Natural forage recourses, in Sinai the main skeleton on which programs of livestock development depend upon it.

*Ochradenus baccatus* is a perennial shrub, height and broad 1-2 m. Most of the plant's photosynthesis has made by the green stems. Flowers yellowish-green, in dense terminal racemes 5-15 cm long. Main flowering period appears from January to May. The fruits are fleshy, 3-5 mm across. The fruits are sweet and be eaten by birds. This species belongs to the Resedaceae family. It grows in rocky terrain with shallow soil, also on salty basins. The plant is distributed in many parts of desert in Egypt. It is reported to enhance healing of wounds and sores and is used by folk medicine. The aqueous alcohol extract of *Ochradenus baccatus* was shown to reduce the blood cholesterol level in rats and normotensive the blood pressure Migahid (1978), Barakat *et al.* (1991) and Fossati *et al.* (1999).

*Deverra tortuosa* (Desf). (= *Pituranthos tortuosus* (Desf), Shabat El-gabal, family Umbelliferae or Apiaceae; Strongly aromatic glabrous shrub, densely branched of bushy appearance with numerous blue-green slender tortuose branched umbel-rays few or numerous, always thin, flowers hardy opening. This plant is predominant in sandy and stony places. Its used of digestive system, headache and fever. High palatability for grazing animals. Its used as seasoning (Boulos, 2000).

Water salinity is a wide spread problem in crop production. However, this problem is usually confined to arid and semi-arid regions. Saline conditions cause physical and chemical changes in soil. This decreases significantly the soil productivity. The kind as well as the concentration of salt affect soil structure and interfere with the nutrition of plant. The anion of salt whether chloride or sulphate is also important. Increasing salinity up to 7500 ppm decreased yield and some chemical composition of *Ochradenous baccatus* and *Deverra tortuosa,* some investigators found that increasing irrigation intervals decreased growth and yield of many species, among whom Ahmed, *et al.* (2002) mentioned that increasing irrigation water salinity from 3000 up to 7000 ppm decreased fresh and dry yield of *Ochradenus baccatus* and *Colutea isteria*. Also, Koyro (2006) pointed out that growth characters of *Plantago coronopus* (L.) depressed by higher salinities from 0 to 100 % seawater salinity (sws). However, Falleh *et al.* (2008) found that leaf growth (leaf biomass, length and number) of *Cynara cardunculus* L. decreased by increasing salinity from 0 to 150 mM NaCl. In addition, Abd El-Azim *et al.* (2009) on *Peganum harmala*, found that there was a significant reduction in plant height, fresh and dry weights / plant with increasing water salinity levels from 3000 to 7000 ppm.

Water stress, which is caused by insufficient soil moisture, is among the chief causes of poor growth or poor health in plants. It is responsible for slow growth and, in severe cases, dieback of stems. It also makes plants more susceptible to disease and less tolerant of insect feeding. Thus, on other plants, the same pervious view was detected showing that greater soil water stress decreased plant height and total fresh and dry weights of *Satureja hortensis*. (Baher *et al.,* 2002). On *Ochradenus baccatus* and *Colutea isteria,* it was found that prolonging the irrigation interval from 10 to 30 days depressed significantly the growth characteristics, crude protein and total carbohydrate.(Ahmed, *et al.,* 2002). While, on *Taverniera aegyptiaca*, it was mentioned that the high moisture contents have distractive effects on

growth. (Amin and Moussa, 2006). on *Peganum harmala,* it was observed that increasing irrigation intervals up to 30 days decreased significantly the yield and crude protein, while total carbohydrate and crude fiber increased by increasing irrigation intervals from 10 to 30 days (Abd El-Azim *et al.,* 2009). On *Ochradenus baccatus*, it was mentioned that prolonging irrigation interval from 15 to 45 days to *Ochradenus baccatus* under Mariut region conditions exerted a statistical significant decrease in crude protein (Ahmed and Abd El-Azim, 2009).

Organic matter added to soil improves the soil structure and feeds the microorganisms and insects. The more beneficial microorganisms in the soil can support, the less bad organisms will survive. The good guys feed on harmful microbes like nematodes and certain soil born diseases. They also release their nutrients into the soil when they die. So the more beneficial microorganisms that are in the soil, the more nutrients will be in the soil and many types of organic matter add still more soil nutrients to the mix. Organic matter also contains acids that can make plant roots more permeable, improving their uptake of water and nutrients, and can dissolve minerals within the soil, leaving them available for plant roots. Prakasa Rao *et al.* (1998) observed that application of farm yard manure increased total yield of *Artemisia pollens*. Also, Sanjutha *et al.* (2008) found that increasing FYM up to 15 t / ha recorded the highest total dry matter production of *Andrographis paniculata* plants.

The aim of this study was to evaluate the effect of three salinity levels and three rates of organic manure (dung sheep) as well as effect of three irrigation intervals and three rates of organic manure on yield and chemical composition of *Ochradenus baccatus Del* and *Deverra tortuosa Desf* grown in calcareous soil.

## MATERIALS AND METHODS

Four field experiments were carried out on *Ochradenus baccatus Del* and *Deverra tortuosa Desf.* Six months old transplants were used. Separate experiments were carried out for each of the two studied range plants. These experiments were conducted in Ras Sudr Research Station, Desert Research Center, at South Sinai Governorate, Egypt during two successive growing seasons i.e. 2008 and 2009. The soil of the location was highly calcareous. The mechanical and chemical analysis of the experimental soil was conducted and are shown in Table (1).

The design of each experiment was split plot with three replications, every replicate included 9 treatments which were the combination of three salinity levels or three irrigation intervals and three rates of organic manure (sheep dung). The main plots were devoted to the water salinity treatments or irrigation intervals, while the sub-plots were occupied with the organic manure treatments. The experimental treatments under the investigation were as follows:

**First experiment**

This experiment was divided into two experiments for *Ochradenus baccatus Del*. and *Deverra tortuosa Desf*.

**A-Water irrigation salinity**

1-Irrigation with saline water having average 3500 ppm.
2-Irrigation with saline water having average 5500 ppm.
3-Irrigation with saline water having average 7500 ppm.

**This experiment irrigated every 15 day**

**B-Organic manure**

1-Control
2-Applying 10 $m^3$ organic manure
3- Applying 20 $m^3$ organic manure

**Second experiment**

This experiment was divided into two experiment for *Ochradenus baccatus* and *Deverra tortuosa*.

**A-Irrigation interval**

1-Irrigated every 15 days (420 $m^3$ / feddan / 6 months)
2-Irrigated every 30 days (210 $m^3$ / feddan / 6 months)
3-Irrigated every 45 days (105 $m^3$ / feddan / 6 months)

This experiment irrigated with 3500 ppm.

**B-Organic manure**

1-Control
2-Applying 10 $m^3$ organic manure
3- Applying 20 $m^3$ organic manure

The experimental plot area was 9 $m^2$ area (6 m length x 1.5 m wide) each were established after ploughing twice, consisting of 4 plants. The distance between plants was 1.5 m and 1.5 m between lines. Before transplanting, 100 kg calcium superphosphate (15.5% $P_2O_5$) per feddan was added. In addition, 150 kg ammonium sulphate (20.5% N) and 100 kg potassium sulphate (48% $K_2O$) were applied after one and two months from transplanting. The experiment site was irrigated immediately just after transplanting (21 July 2007) until 21 September 2007, by saline water pumped from a well (3500 ppm). The analysis of irrigation water and organic manure are given in Tables (2 & 3), respectively.

Four plants were taken from each sub-plot from three replicates after 6, 12, 18 and 24 months from transplanting to determine the following characteristics:

**1- Fresh and dry yield per faddan (ton)**

It was determined at 6, 12, 18 and 24 months from transplanting. Number of plants in **faddan** was 1867 plant.

**2-Chemical composition**

Representative samples were taken at 6, 12, 18 and 24 months from each plot. Samples were dried in an electric oven (70$^oC$) till a constant weight was reached. Samples were milled to a fine powder material and kept for the following analysis:

1-Crude protein percentage**:** total nitrogen percentage was determined by using the modified kieldahle as outlined by the A.O.A.C. (1980). The protein content was calculated by multiplying the total nitrogen % by 6.25 (Tripath *et al.* 1971).
2-Total carbohydrate was determined according to A.O.A.C. (1970).
3-Crude fiber content was determined according toA.O.A.C. (1970).

**Statistical analysis**

All data obtained from the experiment were subjected to the proper statistical analysis of variance of the split plot design according to the procedure outlined by Snedecor and Cochran (1969). Mean values of treatments were differentiated by using L.S.D at 5% level as mentioned by Steel (1960).

**Table 1: Physical and chemical properties of the experimental soil.**

| Physical properties | | | | | | | |
|---|---|---|---|---|---|---|---|
| Depth (cm) | $Caco_3$% | Coarse sand ( 1 – 0.5)% | Fine sand (0.25– 0.1) % | Silt (0.05 - 0.002)% | Total sand (0.1-1)% | Clay < (0.002)% | Class texture |
| % | | | | | | | |
| 0-30 | 55.85 | 54.51 | 25.88 | 8.24 | 80.49 | 11.27 | Sandy loam |
| 30-60 | 51.21 | 24.36 | 62.12 | 7.10 | 86.48 | 6.42 | Sandy loam |

| Chemical properties | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Depth (cm) | pH | Ec $dS/m^2$ | Saturation soluble extract | | | | | | | |
| | | | Soluble anions (meq / L) | | | | Soluble cations ( meq / L) | | | |
| | | | $Co^{--}_3$ | $HCO^-_3$ | $So_4^{--}$ | $Cl^-$ | $Ca^{++}$ | $Mg^{++}$ | $Na^+$ | $K^+$ |
| 0-30 | 7.7 | 4.77 | 0.00 | 6.00 | 10.50 | 31.20 | 24.00 | 11.00 | 10.52 | 2.18 |
| 30-60 | 7.4 | 4.16 | 0.00 | 3.00 | 16.10 | 22.50 | 16.83 | 6.00 | 17.80 | 0.097 |

**Table 2: Chemical analysis of the irrigation water.**

| Well (ppm) | pH | EC $Ds/m^2$ | Soluble anions (meq/l) | | | | Soluble cations (meq/l) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | $Ca^-_3$ | $HCO^-_3$ | $SO^-_4$ | $Cl^-$ | $Ca^{++}$ | $Mg^{++}$ | $Na^+$ | $K^+$ |
| 3500 | 7.8 | 5.47 | - | 2.50 | 16.42 | 81.08 | 25.29 | 19.43 | 54.83 | 0.45 |
| 5500 | 8.1 | 8.59 | - | 2.64 | 10.44 | 86.92 | 24./82 | 18.57 | 5613 | 0.48 |
| 7500 | 8.6 | 11.72 | - | 2.89 | 7.67 | 89.44 | 23.54 | 16.62 | 59.34 | 0.50 |

**Table 3: Analysis of sheep dung manure during 2008 and 2009 seasons.**

| 2008 | | | 2009 | | |
|---|---|---|---|---|---|
| N% | P% | K% | N% | P% | K% |
| 0.69 | 0.45 | 0.78 | 0.67 | 0.43 | 0.75 |

## RESULTS AND DISCUSSION

**A- First experiment.**

**1- Effect of irrigation with saline water, organic manure and their interactions**

**1-1- Fresh and dry yields**

Results in Tables 4 and 5 indicate clearly that irrigation with saline water had a dwarfing effect on *Ochradenous baccatus* and *Deverra tortuosa* plants. There was a significant reduction in fresh and dry yields with increasing water salinity level at 6, 12, 18 and 24 months from transplanting during 2008 and 2009 seasons. The depression effect of salinity might be attributed to the increasing in the energy amount required for absorption of water and minerals. Moreover, increasing salt concentration in irrigation water resulted in a decrease in partial molar free energy of water by increasing its osmotic pressure and decreasing its availability to the plants. Consequently, plant must expend more energy to absorb particular amount of

water hence decreased growth of plants resulted in decrease of fresh and dry yields. Similar results were obtained by Ahmed, *et al.,* (2002) who suggested that the highest values of fresh and dry yields of *Ochradenus baccatus* and *Colutea isteria* plants were obtained under the irrigation of low salinity level (3000 ppm).

Results illustrated in Tables 4 and 5 show that increasing organic manure rate from 0 to 20 $m^3$ / fad. had a significant effect on fresh and dry yields of *Ochradenus baccatus* and *Deverra tortuosa* at 6, 12, 18 and 24 months from transplanting during 2008 and 2009 seasons. This increase may be due to that organic manure may improve soil structure, mineral availability and soil pH, resulting to more favourable edaphic environment for root growth. These results are confirmed with that suggested by Prakasa Rao *et al.* (1998) on *Artemisia pollens* and Sanjutha *et al.* (2008) on *Andrographis paniculata* plants.

**Table 4: Means of fresh and dry yield of *Ochradenous baccatus* at 6, 12, 18 and 24 months from transplanting as affected by irrigation with saline water, organic manure and their interaction.**

**fresh yield (ton/ fad.)**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 1.740 | 2.400 | 2.450 | 2.200 | 2.050 | 2.760 | 2.850 | 2.550 |
| **5500 ppm** | 1.420 | 1.970 | 2.000 | 1.800 | 1.770 | 2.390 | 2.440 | 2.200 |
| **7500 ppm** | 1.150 | 1.540 | 1.573 | 1.420 | 1.290 | 1.900 | 1.960 | 1.720 |
| **Mean** | 1.440 | 1.970 | 2.010 | 1.800 | 1.700 | 2.350 | 2.420 | 2.160 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 2.630 | 3.340 | 3.450 | 3.140 | 2.440 | 3.160 | 3.250 | 2.950 |
| **5500 ppm** | 2.400 | 3.180 | 3.250 | 2.940 | 2.170 | 2.970 | 3.050 | 2.730 |
| **7500 ppm** | 2.180 | 2.720 | 2.780 | 2.560 | 1.930 | 2.420 | 2.510 | 2.290 |
| **Mean** | 2.400 | 3.080 | 3.160 | 2.880 | 2.180 | 2.850 | 2.940 | 2.650 |

**Dry yield (ton/ fad.)**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 0.710 | 0.990 | 1.020 | 0.900 | 0.850 | 1.160 | 1.210 | 1.070 |
| **5500 ppm** | 0.580 | 0.820 | 0.840 | 0.740 | 0.740 | 1.100 | 1.050 | 0.960 |
| **7500 ppm** | 0.480 | 0.640 | 0.670 | 0.590 | 0.550 | 0.810 | 0.850 | 0.740 |
| **Mean** | 0.590 | 0.820 | 0.840 | 0.750 | 0.710 | 1.030 | 1.040 | 0.920 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 1.110 | 1.440 | 1.500 | 1.350 | 1.040 | 1.370 | 1.430 | 1.280 |
| **5500 ppm** | 1.040 | 1.410 | 1.460 | 1.300 | 0.960 | 1.330 | 1.370 | 1.220 |
| **7500 ppm** | 0.950 | 1.220 | 1.260 | 1.140 | 0.870 | 1.120 | 1.170 | 1.050 |
| **Mean** | 1.030 | 1.360 | 1.410 | 1.260 | 0.950 | 1.270 | 1.320 | 1.180 |

| | Fresh yield | | | | Dry yield | | | |
|---|---|---|---|---|---|---|---|---|
| **L.S.D at 5 % for** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** |
| **Salinity** | **0.057** | **0.009** | **0.036** | **0.019** | **0.079** | **0.008** | **0.016** | **0.010** |
| **Organic manure** | **0.038** | **0.029** | **0.042** | **0.046** | **0.074** | **0.022** | **0.030** | **0.031** |
| **SalinityXOrganic manure** | **0.066** | **0.050** | **0.033** | **0.080** | **N.S** | **N.S** | **N.S** | **0.053** |

Results in Tables 4 and 5 indicate that the interaction between salinity levels and organic manure rates had a significant effect on fresh yields of *Ochradenus baccatus* at 6, 12, 18 and 24 months from transplanting. This

effect was significant on dry yield of *Ochradenus baccatus* at 24 month only and on dry yield of *Deverra tortuosa* at 18 month only. However, the heaviest yield of fresh and dry for both range plants was obtained when 3500 ppm salinity and 20 $m^3$ / fad. organic manure were added.

**Table 5: Means of fresh and dry yield of *Deverra tortuosa* at 6, 12, 18 and 24 months from transplanting as affected by irrigation with saline water, organic manure and their interaction.**

**Fresh yield (ton/ fad.)**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 0.819 | 1.165 | 1.188 | 1.057 | 1.007 | 1.283 | 1.322 | 1.204 |
| **5500 ppm** | 0.781 | 1.120 | 1.147 | 1.016 | 0.974 | 1.241 | 1.293 | 1.169 |
| **7500 ppm** | 0.592 | 0.926 | 0.946 | 0.821 | 0.692 | 0.994 | 1.057 | 0.914 |
| **Mean** | 0.731 | 1.070 | 1.094 | 0.965 | 0.891 | 1.173 | 1.224 | 1.096 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 1.234 | 1.443 | 1.532 | 1.403 | 1.094 | 1.294 | 1.398 | 1.262 |
| **5500 ppm** | 1.153 | 1.458 | 1.521 | 1.377 | 1.040 | 1.330 | 1.377 | 1.249 |
| **7500 ppm** | 0.883 | 1.145 | 1.199 | 1.076 | 0.814 | 1.057 | 1.126 | 0.999 |
| **Mean** | 1.090 | 1.349 | 1.417 | 1.285 | 0.983 | 1.227 | 1.300 | 1.170 |

**Dry yield (ton/ fad.)**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 0.396 | 0.572 | 0.588 | 0.519 | 0.496 | 0.643 | 0.665 | 0.601 |
| **5500 ppm** | 0.381 | 0.553 | 0.572 | 0.502 | 0.485 | 0.625 | 0.656 | 0.589 |
| **7500 ppm** | 0.293 | 0.463 | 0.476 | 0.411 | 0.348 | 0.507 | 0.544 | 0.466 |
| **Mean** | 0.357 | 0.529 | 0.545 | 61.86 | 0.443 | 0.592 | 0.622 | 0.552 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 0.630 | 0.764 | 0.806 | 0.733 | 0.545 | 0.716 | 0.747 | 0.669 |
| **5500 ppm** | 0.598 | 0.745 | 0.798 | 0.714 | 0.537 | 0.651 | 0.713 | 0.634 |
| **7500 ppm** | 0.466 | 0.606 | 0.641 | 0.571 | 0.430 | 0.574 | 0.62 | 0.541 |
| **Mean** | 0.565 | 0.705 | 0.748 | 0.673 | 0.504 | 0.647 | 0.693 | 0.615 |

| | Fresh yield | | | | Dry yield | | | |
|---|---|---|---|---|---|---|---|---|
| **L.S.D at 5 % for** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** |
| **Salinity** | **0.032** | **0.024** | **0.021** | **0.037** | **0.017** | **0.013** | **0.010** | **0.020** |
| **Organic manure** | **0.031** | **0.040** | **0.032** | **0.039** | **0.011** | **0.011** | **0.009** | **0.019** |
| **SalinityXOrganic manure** | **N.S** | **N.S** | **N.S** | **N.S** | **N.S** | **N.S** | **0.016** | **N.S** |

## 1-2- Chemical composition

The Results presented in Tables 6 and 7 show that raising salt concentration of irrigation water from 3500 to 7500 ppm decreased crude protein percentage and increased the total carbohydrate and crude fiber % for *Ochradenus baccatus* and *Deverra tortuosa* plants at 6, 12, 18 and 24 months from transplanting. Such reduction in crude protein percentage my be due to failure of plants to make full utilization of nitrogen compounds, the accumulation of nitrogen compounds is more rapid than their utilization in building more cells and organs. There was significant decrease at all growing periods for both plants. These results are in agreement with those found by Ahmed *et al.* (2002) and Abd El-Azim *et al.* (2009)

**Table (6): Means of chemical composition of *Ochradenous baccatus* at 6, 12, 18 and 24 months from transplanting as affected by irrigation with saline water, organic manure and their interaction.**

**Crude protein %**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 12.00 | 12.42 | 12.78 | 12.40 | 11.59 | 12.01 | 12.38 | 11.99 |
| **5500 ppm** | 11.52 | 12.10 | 12.52 | 12.05 | 11.31 | 11.83 | 12.11 | 11.75 |
| **7500 ppm** | 11.24 | 11.84 | 12.09 | 11.73 | 11.04 | 11.58 | 11.84 | 11.48 |
| **Mean** | 11.59 | 12.12 | 12.46 | 12.06 | 11.31 | 11.81 | 12.11 | 11.74 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 11.24 | 11.57 | 11.95 | 11.59 | 11.13 | 11.31 | 11.65 | 11.36 |
| **5500 ppm** | 11.01 | 11.32 | 11.53 | 11.29 | 10.44 | 11.00 | 11.11 | 10.85 |
| **7500 ppm** | 10.53 | 10.87 | 11.48 | 10.96 | 10.07 | 10.52 | 10.88 | 10.49 |
| **Mean** | 10.93 | 11.26 | 11.65 | 11.28 | 10.54 | 10.94 | 11.21 | 10.90 |

**Total carbohydrate %**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 29.56 | 29.57 | 30.45 | 29.86 | 30.14 | 30.54 | 31.14 | 30.61 |
| **5500 ppm** | 29.98 | 30.4 | 30.98 | 30.45 | 30.51 | 31.14 | 31.47 | 31.04 |
| **7500 ppm** | 30.48 | 31.02 | 31.67 | 31.06 | 30.85 | 31.58 | 32.09 | 31.51 |
| **Mean** | 30.01 | 30.33 | 31.03 | 30.46 | 30.50 | 31.09 | 31.57 | 31.05 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 31.20 | 31.50 | 32.16 | 31.62 | 31.68 | 32.52 | 32.87 | 32.36 |
| **5500 ppm** | 31.67 | 32.13 | 32.52 | 32.11 | 33.13 | 33.57 | 34.07 | 33.59 |
| **7500 ppm** | 32.02 | 32.54 | 33.19 | 32.58 | 33.68 | 34.64 | 35.19 | 34.50 |
| **Mean** | 31.63 | 32.06 | 32.62 | 32.10 | 32.83 | 33.58 | 34.04 | 33.48 |

**Crude fiber %**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 24.95 | 24.87 | 24.56 | 24.79 | 25.64 | 25.65 | 25.41 | 25.57 |
| **5500 ppm** | 25.55 | 25.51 | 25.22 | 25.43 | 25.91 | 25.91 | 25.66 | 25.83 |
| **7500 ppm** | 25.91 | 25.89 | 25.64 | 25.81 | 26.50 | 26.44 | 25.94 | 26.29 |
| **Mean** | 25.47 | 25.42 | 25.14 | 25.34 | 26.02 | 26.00 | 25.67 | 25.90 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 26.01 | 25.99 | 25.74 | 25.91 | 26.69 | 26.70 | 26.48 | 26.62 |
| **5500 ppm** | 26.34 | 26.35 | 26.03 | 26.24 | 26.91 | 26.88 | 26.63 | 26.81 |
| **7500 ppm** | 26.79 | 26.78 | 26.61 | 26.73 | 27.52 | 27.52 | 27.26 | 27.43 |
| **Mean** | 26.01 | 25.99 | 25.74 | 25.91 | 27.04 | 27.03 | 26.79 | 26.95 |

| | Crude protein | | | | Total carbohydrate | | | | Crude fiber | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **L.S.D at 5 % for** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** |
| **Salinity** | **0.25** | **0.05** | **0.21** | **0.25** | **0.21** | **0.23** | **0.11** | **0.37** | **0.05** | **0.25** | **0.10** | **0.05** |
| **Organic manure** | **0.18** | **0.05** | **0.20** | **0.20** | **0.18** | **0.23** | **0.10** | **0.24** | **0.07** | **0.02** | **0.04** | **0.05** |
| **Salinity X Organic manure** | **N.S** | **N.S** | **N.S** | **N.S** | **N.S** | **N.S** | **0.17** | **N.S** | **0.12** | **N.S** | **0.07** | **N.S** |

**Table (7): Means of chemical composition of *Deverra tortuosa* at 6, 12, 18 and 24 months from transplanting as affected by irrigation with saline water, organic manure and their interaction.**

**Crude protein %**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 8.34 | 8.68 | 8.90 | 8.64 | 8.05 | 8.36 | 8.67 | 8.36 |
| **5500 ppm** | 7.87 | 8.41 | 8.72 | 8.33 | 7.69 | 8.02 | 8.25 | 7.99 |
| **7500 ppm** | 7.61 | 7.92 | 8.36 | 7.97 | 7.22 | 7.55 | 7.85 | 7.54 |
| **Mean** | 7.94 | 8.34 | 8.66 | 8.31 | 7.65 | 7.98 | 8.26 | 7.96 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 7.51 | 7.73 | 8.10 | 7.78 | 7.12 | 7.50 | 7.74 | 7.45 |
| **5500 ppm** | 7.21 | 7.47 | 7.77 | 7.48 | 6.83 | 7.11 | 7.45 | 7.13 |
| **7500 ppm** | 6.57 | 6.82 | 7.07 | 6.82 | 6.59 | 6.78 | 7.09 | 6.82 |
| **Mean** | 7.09 | 7.34 | 7.65 | 7.36 | 6.85 | 7.13 | 7.43 | 7.13 |

**Total carbohydrate %**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 33.19 | 33.60 | 34.34 | 33.71 | 34.21 | 34.53 | 35.08 | 34.61 |
| **5500 ppm** | 33.62 | 34.16 | 34.70 | 34.16 | 34.64 | 35.24 | 35.80 | 35.23 |
| **7500 ppm** | 34.09 | 35.41 | 35.69 | 35.06 | 35.08 | 36.10 | 36.59 | 35.92 |
| **Mean** | 33.63 | 34.39 | 34.91 | 34.31 | 34.64 | 35.29 | 35.82 | 35.25 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 34.68 | 35.15 | 35.63 | 35.15 | 35.47 | 36.02 | 36.57 | 36.02 |
| **5500 ppm** | 35.06 | 35.61 | 36.09 | 35.59 | 36.01 | 36.70 | 37.36 | 36.69 |
| **7500 ppm** | 35.49 | 35.92 | 36.70 | 36.04 | 36.39 | 37.13 | 38.28 | 37.27 |
| **Mean** | 35.08 | 35.56 | 36.14 | 35.59 | 35.96 | 36.61 | 37.40 | 36.66 |

**Crude fiber %**

| Water salinity levels | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **3500 ppm** | 32.83 | 32.82 | 32.56 | 32.74 | 34.15 | 34.15 | 33.73 | 34.01 |
| **5500 ppm** | 34.26 | 34.25 | 33.97 | 34.16 | 34.97 | 34.96 | 34.64 | 34.86 |
| **7500 ppm** | 34.91 | 34.83 | 34.44 | 34.73 | 35.35 | 35.34 | 34.98 | 35.22 |
| **Mean** | 34.00 | 33.97 | 33.66 | 33.87 | 34.82 | 34.82 | 34.45 | 34.70 |
| | 18 months | | | | 24 months | | | |
| **3500 ppm** | 34.67 | 34.67 | 34.40 | 34.58 | 35.24 | 35.22 | 34.78 | 35.08 |
| **5500 ppm** | 35.48 | 35.40 | 34.92 | 35.27 | 35.79 | 35.74 | 35.23 | 35.59 |
| **7500 ppm** | 35.88 | 35.80 | 35.44 | 35.71 | 36.24 | 36.18 | 35.89 | 36.10 |
| **Mean** | 35.34 | 35.29 | 34.92 | 35.18 | 35.76 | 35.71 | 3530 | 35.59 |

| | Crude protein | | | | Total carbohydrate | | | | Crude fiber | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **L.S.D at 5 % for** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** |
| **Salinity** | **0.06** | **0.08** | **0.09** | **0.04** | **0.12** | **0.02** | **0.17** | **0.07** | **0.18** | **0.05** | **0.04** | **0.04** |
| **Organic manure** | **0.03** | **0.04** | **0.04** | **0.03** | **0.07** | **0.08** | **0.07** | **0.08** | **0.25** | **0.06** | **0.04** | **0.12** |
| **Salinity X Organic manure** | **0.05** | **N.S** | **N.S** | **0.06** | **0.13** | **0.14** | **0.13** | **0.14** | **N.S** | **N.S** | **0.06** | **0.06** |

Results in Tables 6 and 7 indicate clearly that increasing organic manure rate from 0 to 20 $m^3$ / fad. significantly increased crude protein and total carbohydrate % and decreased crude fiber % for *Ochradenus baccatus Del.* and *Deverra tortuosa Desf* plants. These increments were significant at all growing periods. Increasing crude protein my be due to the effect of sheep dung on improving the edaphic environmental conditions, i.e. release lot nitrogen during the degradation of organic manure, increase the soil microflora activity which could in turn fixe more nitrogen which can be used by the plant roots. These results are in accordance with those reported by Sanjutha *et al.* (2008) on *Andrographis paniculata* plants.

The results in Tables 6 and 7 show that the highest value of crude protein % for *Ochradenus baccatus Del.* and *Deverra tortuosa Desf* plants was recorded with 3500 ppm and 20 $m^3$ organic manure at 6, 12, 18 and 24 months from transplanting. On the other hand, total carbohydrate % of two range plants increased at more salinity level under high rate of organic manure (20 $m^3$ / fad.) in all growing periods, while crude fiber % increased by increasing water irrigation salinity up to 7500 ppm under without organic manure.

**B- Second experiment**

**1- Effect of irrigation intervals, organic manure and their interactions**

**1-1- Fresh and dry yields**

The results in Tables 8 and 9 show that fresh and dry yields of *Ochradenus baccatus Del.* and *Deverra tortuosa Desf*. significantly decreased by increasing the irrigation periods. This is to be expected since water plays an important role in plant activity and moisture deficits can have a deleterious effected on most photosynthesis processes. The highest values of fresh and dry yields of the two plants under study were obtained with 15 days irrigation interval. These results are in accordance with those reported by Khalifa (1996) who pointed out that in the concerned shrubs (Atriplex and Acacia) irrigation interval at 10 days resulted in the highest forage yield productivity throughout the experimental period. Also, Abd El-Azim *et al.* (2009) on *Peganum harmala,*it was observed that increasing irrigation interval up to 30 days significantly decreased fresh and dry yields.

The results in Tables 8 and 9 indicate that increasing organic manure rate from 0 to 20 $m^3$ / fad. fresh and dry yields of *Ochradenus baccatus Del.* and *Deverra tortuosa Desf* were increased at 6, 12, 18 and 24 months from transplanting.

It can be noticed from Tables (8 and 9) that the heaviest yield of fresh and dry for both range plants was obtained when irrigation interval every 15 day and organic manure were added at the rate of 20 $m^3$ / fad. Similar findings were obtained by Harbir *et al.* (1984) and Prakasa Rao *et al.* (1998).

**Table (8): Means of fresh and dry yield of *Ochradenous baccatus* at 6, 12, 18 and 24 months from transplanting as affected by irrigation intervals, organic manure and their interaction.**

**Fresh yield (ton/ fad.)**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 2.330 | 2.650 | 2.690 | 2.557 | 2.740 | 3.170 | 3.230 | 3.047 |
| **30 days** | 2.280 | 2.610 | 2.650 | 2.513 | 2.690 | 3.100 | 3.180 | 2.990 |
| **45 days** | 1.940 | 2.120 | 2.260 | 2.107 | 2.420 | 2.670 | 2.820 | 2.637 |
| **Mean** | 2.183 | 2.460 | 2.533 | 2.392 | 2.617 | 2.980 | 3.077 | 2.891 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 2.980 | 3.510 | 3.550 | 3.347 | 3.250 | 3.700 | 3.750 | 3.567 |
| **30 days** | 2.940 | 3.450 | 3.480 | 3.290 | 3.200 | 3.650 | 3.700 | 3.517 |
| **45 days** | 2.560 | 2.930 | 2.980 | 2.823 | 2.750 | 3.030 | 3.080 | 2.953 |
| **Mean** | 2.827 | 3.297 | 3.337 | 3.153 | 3.067 | 3.460 | 3.510 | 3.346 |

**Dry yield (ton/ fad.)**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 0.953 | 1.100 | 1.120 | 1.058 | 1.140 | 1.330 | 1.370 | 1.280 |
| **30 days** | 0.926 | 1.070 | 1.100 | 1.032 | 1.130 | 1.320 | 1.360 | 1.270 |
| **45 days** | 0.802 | 0.922 | 0.957 | 0.894 | 1.020 | 1.150 | 1.230 | 1.133 |
| **Mean** | 0.897 | 1.031 | 1.059 | 0.994 | 1.097 | 1.267 | 1.320 | 1.228 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 1.260 | 1.530 | 1.570 | 1.453 | 1.410 | 1.630 | 1.680 | 1.573 |
| **30 days** | 1.280 | 1.510 | 1.540 | 1.443 | 1.380 | 1.610 | 1.650 | 1.547 |
| **45 days** | 1.120 | 1.320 | 1.350 | 1.263 | 1.240 | 1.390 | 1.430 | 1.353 |
| **Mean** | 1.220 | 1.453 | 1.487 | 1.387 | 1.343 | 1.543 | 1.587 | 1.491 |

| | Fresh yield | | | | Dry yield | | | |
|---|---|---|---|---|---|---|---|---|
| **L.S.D at 5 % for** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** |
| **Irrigation intervals** | **0.210** | **0.018** | **0.012** | **0.019** | **0.088** | **0.009** | **0.020** | **0.016** |
| **Organic manure** | **0.020** | **0.040** | **0.030** | **0.029** | **0.013** | **0.027** | **0.028** | **0.027** |
| **Irrigation X Organic manure** | **0.034** | **0.070** | **0.052** | **0.050** | **N.S** | **N.S** | **N.S** | **N.S** |

**Table (9): Means of fresh and dry yield of *Deverra tortuosa* at 6, 12, 18 and 24 months from transplanting as affected by irrigation intervals, organic manure and their interaction.**

**Fresh yield (ton/ fad.)**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 1.030 | 1.228 | 1.264 | 1.174 | 1.264 | 1.399 | 1.431 | 1.365 |
| **30 days** | 0.895 | 1.029 | 1.098 | 1.007 | 1.032 | 1.148 | 1.194 | 1.125 |
| **45 days** | 0.876 | 1.028 | 1.065 | 0.990 | 0.997 | 1.112 | 1.163 | 1.091 |
| **Mean** | 0.934 | 1.095 | 1.142 | 1.057 | 1.098 | 1.220 | 1.263 | 1.193 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 1.389 | 1.539 | 1.584 | 1.504 | 1.576 | 1.696 | 1.742 | 1.671 |
| **30 days** | 1.098 | 1.36 | 1.389 | 1.282 | 1.279 | 1.444 | 1.478 | 1.400 |
| **45 days** | 1.075 | 1.315 | 1.361 | 1.250 | 1.248 | 1.436 | 1.463 | 1.382 |
| **Mean** | 1.187 | 1.405 | 1.445 | 1.346 | 1.368 | 1.525 | 1.561 | 1.485 |

**Dry yield (ton/ fad.)**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 0.499 | 0.603 | 0.625 | 0.576 | 0.623 | 0.701 | 0.721 | 0.682 |
| **30 days** | 0.438 | 0.509 | 0.548 | 0.498 | 0.514 | 0.579 | 0.607 | 0.567 |
| **45 days** | 0.434 | 0.513 | 0.535 | 0.494 | 0.501 | 0.567 | 0.599 | 0.556 |
| **Mean** | 0.457 | 0.542 | 0.569 | 0.523 | 0.546 | 0.616 | 0.642 | 0.601 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 0.709 | 0.795 | 0.824 | 0.776 | 0.773 | 0.853 | 0.889 | 0.838 |
| **30 days** | 0.569 | 0.712 | 0.740 | 0.674 | 0.671 | 0.777 | 0.801 | 0.750 |
| **45 days** | 0.567 | 0.696 | 0.728 | 0.664 | 0.659 | 0.78 | 0.806 | 0.748 |
| **Mean** | 0.615 | 0.734 | 0.764 | 0.704 | 0.701 | 0.803 | 0.832 | 0.779 |

| | Fresh yield | | | | Dry yield | | | |
|---|---|---|---|---|---|---|---|---|
| **L.S.D at 5 % for** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** |
| **Salinity** | **0.024** | **0.009** | **0.016** | **0.018** | **0.008** | **0.007** | **0.010** | **0.024** |
| **Organic manure** | **0.025** | **0.014** | **0.020** | **0.025** | **0.019** | **0.011** | **0.016** | **0.018** |
| **SalinityXOrganic manure** | **N.S** | **N.S** | **0.035** | **N.S** | **N.S** | **N.S** | **0.028** | **N.S** |

### 1-2- Chemical composition

Results in Tables 10 and 11 show that prolonging the irrigation interval from 15 to 45 days decreased the crude protein percentage of *Ochradenus baccatus* and *Deverra tortuosa* range plants at different periods of plant age. The depression in protein content may be due to disturbance in energy metabolism in plants grown under the longest irrigation interval. Such effect caused an increase in amino acids because of the failure in corporation of these substances into protein. On the contrary, total carbohydrate and crude fiber % for two range plants increased by increasing irrigation interval from 15 to 45 days. Similar finding was obtained by Nassar (1983) and Ahmed and Abd El-Azim (2009).

The results in Tables 10 and 11 show that crude protein and total carbohydrate of two range plants significantly increased by increasing organic manure rate from 0 to 20 $m^3$ / fad. On the other hand, increasing organic manure up to 20 $m^3$ / fad. decreased crude fiber percentage. These results are in agreement with those obtained by Sanjutha *et al.* (2008).

**Table (10): Means of chemical composition of *Ochradenous baccatus* at 6, 12, 18 and 24 months from transplanting as affected by irrigation intervals, organic manure and their interaction.**

**Crude protein %**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 12.59 | 12.80 | 13.12 | 12.84 | 12.20 | 12.48 | 12.73 | 12.47 |
| **30 days** | 12.20 | 12.58 | 12.73 | 12.50 | 11.63 | 11.77 | 12.11 | 11.83 |
| **45 days** | 11.90 | 12.31 | 12.56 | 12.26 | 11.24 | 11.44 | 11.68 | 11.45 |
| **Mean** | 12.23 | 12.56 | 12.80 | 12.53 | 11.69 | 11.90 | 12.17 | 11.92 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 11.66 | 12.06 | 12.41 | 12.04 | 11.17 | 11.48 | 11.71 | 11.45 |
| **30 days** | 11.18 | 11.54 | 11.71 | 11.47 | 10.64 | 10.99 | 11.43 | 11.02 |
| **45 days** | 10.90 | 11.25 | 11.59 | 11.25 | 10.24 | 10.59 | 10.79 | 10.54 |
| **Mean** | 11.25 | 11.62 | 11.90 | 11.59 | 10.68 | 11.02 | 11.31 | 11.00 |

**Total carbohydrate %**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 29.71 | 30.51 | 30.73 | 30.32 | 30.63 | 30.99 | 31.54 | 31.05 |
| **30 days** | 30.34 | 30.75 | 31.16 | 30.75 | 31.14 | 31.62 | 31.83 | 31.53 |
| **45 days** | 30.65 | 31.23 | 31.75 | 31.21 | 31.58 | 31.89 | 32.28 | 31.92 |
| **Mean** | 30.23 | 30.83 | 31.21 | 30.76 | 31.12 | 31.5 | 31.88 | 31.5 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 31.44 | 31.76 | 32.38 | 31.86 | 32.01 | 32.58 | 32.99 | 32.53 |
| **30 days** | 31.76 | 32.26 | 32.73 | 32.25 | 32.5 | 32.72 | 33.53 | 32.92 |
| **45 days** | 32.13 | 32.7 | 33.19 | 32.67 | 32.81 | 33.25 | 33.79 | 33.28 |
| **Mean** | 31.78 | 32.24 | 32.77 | 32.26 | 32.44 | 32.85 | 33.44 | 32.91 |

**Crude fiber %**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 24.02 | 23.81 | 23.65 | 23.83 | 24.67 | 24.29 | 23.89 | 24.28 |
| **30 days** | 24.81 | 24.54 | 24.12 | 24.49 | 25.23 | 24.95 | 24.66 | 24.94 |
| **45 days** | 25.05 | 24.82 | 24.41 | 24.76 | 25.78 | 25.37 | 25.09 | 25.41 |
| **Mean** | 24.63 | 24.39 | 24.06 | 24.36 | 25.22 | 24.87 | 24.55 | 24.88 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 24.96 | 24.73 | 24.46 | 24.72 | 25.87 | 25.62 | 25.38 | 25.63 |
| **30 days** | 25.90 | 25.60 | 25.23 | 25.58 | 26.12 | 25.83 | 25.63 | 25.86 |
| **45 days** | 26.21 | 26.01 | 25.82 | 26.02 | 26.84 | 26.57 | 26.25 | 26.55 |
| **Mean** | 25.69 | 25.45 | 25.17 | 25.44 | 26.28 | 26.01 | 25.75 | 26.01 |

| | Crude protein | | | | Total carbohydrate | | | | Crude fiber | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **L.S.D at 5 % for** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** |
| **Salinity** | **0.07** | **0.03** | **0.25** | **0.03** | **0.08** | **0.19** | **0.05** | **0.04** | **0.08** | **0.04** | **0.05** | **0.05** |
| **Organic manure** | **0.05** | **0.04** | **0.22** | **0.04** | **0.04** | **0.18** | **0.04** | **0.03** | **0.19** | **0.05** | **0.04** | **0.06** |
| **Salinity X Organic manure** | **0.09** | **0.06** | **N.S** | **0.06** | **0.06** | **N.S** | **0.07** | **0.04** | **0.14** | **0.07** | **0.08** | **N.S** |

Results in Tables (10 and 11) show that crude protein % for both range plants decreased with increasing prolonging irrigation interval up to 45 days under control of organic manure treatment (sheep dung) in all different

periods of plant age. The highest values of total carbohydrate and crude fiber were obtained from 45 days interval under 20 m3 / fad. and control treatment of organic manure, respectively at 6, 12, 18 and 24 months from transplanting.

**Table (11): Means of chemical composition of *Deverra tortuosa* at 6, 12, 18 and 24 months from transplanting as affected by irrigation intervals, organic manure and their interaction.**

**Crude protein %**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 7.99 | 8.35 | 8.74 | 8.36 | 7.64 | 8.02 | 8.40 | 8.02 |
| **30 days** | 7.47 | 7.74 | 7.98 | 7.73 | 7.20 | 7.51 | 7.76 | 7.49 |
| **45 days** | 7.10 | 7.54 | 7.84 | 7.49 | 6.61 | 6.90 | 7.35 | 6.95 |
| **Mean** | 7.52 | 7.87 | 8.18 | 7.86 | 7.15 | 7.48 | 7.84 | 7.49 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 6.99 | 7.32 | 7.71 | 7.34 | 6.54 | 6.77 | 7.06 | 6.79 |
| **30 days** | 6.50 | 6.86 | 7.25 | 6.87 | 6.09 | 6.37 | 6.70 | 6.39 |
| **45 days** | 6.34 | 6.42 | 6.73 | 6.50 | 5.52 | 5.85 | 6.18 | 5.85 |
| **Mean** | 6.61 | 6.86 | 7.23 | 6.90 | 6.05 | 6.33 | 6.65 | 6.34 |

**Total carbohydrate %**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 33.24 | 33.70 | 34.15 | 33.70 | 33.79 | 34.15 | 34.77 | 34.24 |
| **30 days** | 33.53 | 34.11 | 34.70 | 34.11 | 34.08 | 34.71 | 35.30 | 34.70 |
| **45 days** | 33.85 | 34.91 | 35.06 | 34.61 | 34.69 | 35.25 | 35.85 | 35.26 |
| **Mean** | 33.54 | 34.24 | 34.64 | 34.14 | 34.19 | 34.70 | 35.31 | 34.73 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 34.31 | 34.70 | 35.07 | 34.69 | 34.98 | 35.50 | 35.83 | 35.44 |
| **30 days** | 34.72 | 35.17 | 35.66 | 35.18 | 35.59 | 36.18 | 36.70 | 36.16 |
| **45 days** | 35.01 | 35.68 | 36.30 | 35.66 | 36.01 | 36.70 | 37.29 | 36.67 |
| **Mean** | 34.68 | 35.18 | 35.68 | 35.18 | 35.53 | 36.13 | 36.61 | 36.09 |

**Crude fiber %**

| Irrigation intervals | 6 months | | | Mean | 12 months | | | Mean |
|---|---|---|---|---|---|---|---|---|
| | Organic manure | | | | Organic manure | | | |
| | Control | 10 $m^3$ | 20 $m^3$ | | Control | 10 $m^3$ | 20 $m^3$ | |
| **15 days** | 33.90 | 33.57 | 33.26 | 33.58 | 34.30 | 33.94 | 33.67 | 33.97 |
| **30 days** | 34.39 | 34.02 | 33.75 | 34.05 | 34.88 | 34.44 | 34.01 | 34.44 |
| **45 days** | 34.73 | 34.40 | 34.01 | 35.31 | 35.17 | 34.76 | 34.39 | 34.77 |
| **Mean** | 34.34 | 34.00 | 33.67 | 34.00 | 34.78 | 34.38 | 34.02 | 34.40 |
| | 18 months | | | | 24 months | | | |
| **15 days** | 34.75 | 34.38 | 33.99 | 34.37 | 34.91 | 34.55 | 34.17 | 34.54 |
| **30 days** | 35.13 | 34.69 | 34.32 | 34.72 | 35.33 | 34.97 | 34.02 | 34.97 |
| **45 days** | 35.77 | 35.27 | 34.91 | 35.31 | 35.31 | 35.88 | 35.36 | 34.96 |
| **35.40Mean** | 35.22 | 34.78 | 34.41 | 34.80 | 35.37 | 34.96 | 34.58 | 34.97 |

| | Crude protein | | | | Total carbohydrate | | | | Crude fiber | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **L.S.D at 5 % for** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** | **6** | **12** | **18** | **24** |
| **Salinity** | **0.06** | **0.08** | **0.11** | **0.20** | **0.40** | **0.03** | **0.06** | **0.05** | **0.04** | **0.05** | **0.06** | **0.05** |
| **Organic manure** | **0.07** | **0.03** | **0.04** | **0.09** | **0.36** | **0.06** | **0.05** | **0.05** | **0.07** | **0.06** | **0.03** | **0.04** |
| **SalinityXOrganic manure** | **0.11** | **0.06** | **0.07** | **N.S** | **N.S** | **0.10** | **0.08** | **0.08** | **N.S** | **0.09** | **N.S** | **0.25** |

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## تـأثير الإجهـاد المـائى والملحـى والسـماد العضـوى علـى بعـض النباتـات الرعويـة الطبيعية بجنوب سيناء

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**** قسم البيئة النباتية والمراعى – مركز بحوث الصحراء**

أقيمت أربع تجارب حقلية على بمحطة بحوث رأس سدر التابعة لمركز بحوث الصحراء بمحافظة جنوب سيناء خلال موسمى ٢٠٠٨ و ٢٠٠٩ . تهدف هذه الدراسة دراسة تأثير مستويات الملوحة ٣٥٠٠ و ٥٥٠٠ و ٧٥٠٠ جزء فى المليون والتسميد العضوى صفر و ١٠ و ٢٠ م٣ / فدان وكذلك تأثير فترات الرى ١٥ و ٣٠ و ٤٥ يوم والتسميد العضوى صفر و ١٠ و ٢٠ م٣ / فدان والتداخل بينهما على المحصول والتركيب الكيماوى على لنبانى القرضى *Ochradenous baccatus Del* والقزاح *Deverra tortuosa Desf*. وتضمنت كل تجربة ٩ معاملات وزعت فى تصميم قطع منشقة مرة واحدة وتم أخذ القياسات بعد ٦ و ١٢ و ١٨ و ٢٤ شهر من الشتل،.

**ومن أهم النتائج المتحصل عليها التالى :**

**١- تأثير ملوحة ماء الرى والسماد العضوى والتفاعل بينهما**

**١-١- المحصول الغض والجاف (طن/ فدان)**

-أوضحت النتائج أن زيادة تركيز الأملاح من ٣٥٠٠ إلى ٧٥٠٠ جزء فى المليون إلى نقص معنوي في المحصول الغض والجاف لنبانى القرضى والقزاح عند أعمار ٦ و ١٢ و ١٨ و ٢٤ شهر من الشتل. وأمكن الحصول على أقصى قيمة للمحصول العلفى الغض والجاف عند تركيز ملوحة ٣٥٠٠ جزء فى المليون.

- أشارت النتائج إلى أن زيادة معدل السماد العضوى من صفر إلى ٢٠ م٣ / فدان إلى زيادة معنوية للمحصول العلفى الغض والجاف لنبات القرضى والقزاح خلال مراحل النمو المختلفة.
- أظهرت النتائج أن الحصول على أعلى قيمة من المحصول العلفى الغض والجاف لكلا النوعيين عند الرى بماء تركيز ملوحتة ٣٥٠٠ جزء فى المليون وإضافة ٢٠ م٣ / فدان سماد غنم خلال مراحل النمو المختلفة

**١-٢- التركيب الكيماوى**

- أشارت النتائج إلى أن زيادة الملوحة من ٣٥٠٠ إلى ٧٥٠٠ جزء في المليون إلى نقص معنوى فى النسبة المئوية للبروتين الخام فى أنسجة نبانى القرضى والقزاح وزادت النسبة المئوية للكربوهيدرات الكلية والألياف الخام بزيادة تركيز الملوحة من ٣٥٠٠ إلى ٧٥٠٠ جزء فى المليون٠
- أوضحت النتائج أن زيادة معدل السماد من صفر إلى ٢٠ م٣ / فدان إلى زيادة معنوية فى النسبة المئوية للبروتين الخام والكربوهيدرات الكلية و نقص معنوى فى نسبة الألياف الخام لنبات القرضى والقزاح عند فترات النمو ٦ و ١٢ و ١٨ و ٢٤ شهر من الشتل..
- أظهرت النتائج أنه للحصول على أعلى قيمة من البروتين الخام لكلا النوعيين عند الرى بماء تركيز ملوحتة ٣٥٠٠ جزء فى المليون وإضافة ٢٠ م٣ / فدان سماد غنم و أمكن الحصول على أعلى قيمة من الكربوهيدرات الكلية والألياف الخام لنبانى القرضى والقزاح عند الرى بماء تركيز ملوحتة ٧٥٠٠ جزء فى المليون وعند معاملة ٢٠ م٣ / فدان ومعاملة الكنترول على التوالى خلال مراحل النمو المختلفة.

**٢- تأثير فترات الرى والسماد العضوى والتفاعل بينهما**

**٢-١- المحصول الغض والجاف (طن/ فدان)**

- أشارت النتائج إلى أن زيادة فترات الرى من ١٥ إلى ٤٥ يوم إلى زيادة معنوية فى المحصول العلفى الغض والجاف لنبات القرضى والقزاح خلال مراحل النمو المختلفة.
- أظهرت النتائج إلى أن زيادة معدل السماد العضوى من صفر إلى ٢٠ م٣ / فدان إلى زيادة معنوية فى المحصول العلفى الغض والجاف لنبات القرضى والقزاح خلال مراحل النمو المختلفة.
- أظهرت النتائج أنه للحصول على أعلى قيمة من المحصول العلفى الغض والجاف لنبات القرضى والقزاح عند الرى كل ١٥ يوم وإضافة ٢٠ م٣ / فدان سماد غنم خلال مراحل النمو المختلفة

**٢-٢- التركيب الكيماوى**

- لقد سجل زيادة فترة الرى من ١٥ إلى ٤٥ يوم إلى نقص معنوى فى النسبة المئوية للبروتين الخام فى نبانى القرضى والقزاح وزادت النسبة المئوية للكربوهيدرات الكلية والألياف الخام بزيادة فترة الرى حتى ٤٥ يوم.
- أدت زيادة معدل السماد العضوى حتى ٢٠ م٣ / فدان إلى زيادة معنوية فى النسبة المئوية للبروتين الخام والكربوهيدرات الكلية و نقص معنوى فى نسبة الألياف الخام لنبات القرضى والقزاح خلال مراحل النمو المختلفة.
- أشارت النتائج إلى أنه للحصول على أعلى قيمة من البروتين الخام لكلا النوعيين عند الرى كل ١٥ يوم وإضافة ٢٠ م٣ / فدان سماد غنم و أمكن الحصول على أعلى قيمة من الكربوهيدرات الكلية والألياف الخام لنبانى القرضى والقزاح عند الرى كل ٤٥ يوم وإضافة ٢٠ م٣ / فدان ومعاملة الكنترول على التوالى عند فترات النمو ٦ و ١٢ و ١٨ و ٢٤ شهر من الشتل.

توصى الدراسة لزيادة المحصول الغض والجاف لنباتى المراعى القرضى والمزاح وذلك بزيادة معدل اضافة السماد العضوى حتى ٢٠م٣/ فدان تحت مستويات الملوحة المختلفة وكذلك عند فترات الرى المختلفة.

**قام بتحكيم البحث**

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