A study on some management practice in calcareous soils and their refelection on soil physical, mechanical properties and crop production

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5. SUMMARY AND CONCLUSIONA field experiment was conducted for two successive seasons, 1996 and 1997, in Maryut Agricultural Experimental station, D.R.C., Alex, north western coastal zone of Egypt to study some management practices related to calcareous soil properties and crop production. The studied treatments comprised, three compost types, namely town refuse (TR), farmyard manure (FYM) and sheep dung (SD), four application rates Viz. 0, 5, 10 and 15 tons/fed, two irrigation regimes at which irrigation was conducted whenever soil water depletion reached either in the effective root zone 50 or 70 % from the available water range of plant growth, and two biofertilization treatments, i. e, with and without biofertilizer application. All treatments were replicated three times and randomly distributed through split split plot design. Sunflower plant was the test crop. At the end of each growing season seeds, shoots and roots yields as well as oil content of seeds were recorded. Soil physicalproperties were also determined.The obtained results indicated that, the sheep dung compost was superior in decreasing bulk density in the three studied soil depths compared to farmyard and town refuse composts. The higher is the application rate (15-tons/fed.) the lowest is the bulk density value of treated soil. The irrigation regime especially (50 % depletion) and soil inoculation by biofertilizer displayed higher trend of decrease in soil bulk density compared to the control. A significant negative relationship was found between soil bulk density and the organic carbon content in the soil. Total porosity of soil treatments achieved significant increase, upon using composts especially with increasing their application rates. Using the organic composts with different rates especially at 50 % depletion level and biofertilizer application led to an appreciable increase in large, medium and small pores. The farmyard and sheep dung composts surpassed town refuse in medium and small pores while the three composttypes caused the same increase in large pores. By increasing the application rate of composts, especially from (5 to 10 tons/fed.) the mean increase in large, medium and small pores amounted 9, 27 and 14 % relative to the control, respectively. In addition, the effect of composting types with several rates under the suitable condition of irrigation regime (50 % dep.) and biofertilization technique encouraged the formation of macro and micro soil aggregates. The magnitude of increase amounted 58, 56 and 32 % pertaining to sheep dung, farmyard and town refuse, respectively. In addition, the soil moisture retention of the treatments got ahead over the control due to organic composting addition which achieved 41, 33 and 21 % for the high rates of sheep dung, farmyard and town refuse composts, respectively. The effect of short irrigation interval, (50 % dep.) surpassed the long irrigation one, (70 % dep.) in increasing soil moisture retentively by 10 %. As well as, the biofertilizer was positively interacted with the other treatments, it led to 13 % increment in available water than the unbiofertilizer application. Different compost types and rates, especially at greatest rate, under the condition of short irrigation interval and biofertilizer application caused appreciate effect on soil hydraulic conductivity as it changed from moderate to moderately rapid. Regarding, the soil mechanical properties, such as penetration resistance and shear strength,

they were reduced by using organic composts as compared with control, which the reduction amounted 24 and 23 %, respectively. The increment in application rates, irrigation regime as (50 % dep.) and the biofertilization technique helped in reducing soil mechanical strength under any type of compost. The cohesion forces and internal friction angle of the treated soil were declined to great extent, as 40 and 26 % respectively indicating suitable condition to easy soil management, workability and energy saving for agricultural machinery. In regard to soil erodibility, a remarked positive effect of different compost types and rates on difficult and less erodible grains while negative effect on the easily erodible grains. The increase in difficult andSUMMARY AND CONCLUSION124less erodible grains reached 8 and 11 % but the decrease in easily erodible ones amounted 14 % indicating a good response of soil to the organic treatment to resist wind erosion. The irrigation frequency at (50 % dep.) and the application of biofertilizer supported the action of the compost added materials in increasing the soil fractions that resist erosion, especially those of effective diameter, 1 to 0.5-mm 0.5 to 0.15-mm. The crop production as a resultant of any soil amelioration process achieved 131, 42, 133 and 145 % increase, due to organic compost application system in seed weights, oil content, shoot weights and root weights, respectively as compared with the control. The irrigation regime of (50 % dep.) and soil inoculation as biofertilizer were the essential factors that helped in producing successful, component production, as seed, oil content, shoot and root yields. The analysis of variance (ANOVA) emphasized the highly significant effect of compost types, application rates and irrigation regimes on soil physical properties and crop production under biofertilization or tmbiofertilization condition. In addition, several correlation analysis and the corresponding regression equations which joined bulk density, soil aggregation and soil erodibility as correlated with the organic carbon percent of soil treatments were obtained. As well as the relation between available water and hydraulicconductivity as correlated with soil porosity, pore size distribution andsoil aggregates, was computed and the equations suitable to thoserelations were detected. Also, the correlation and linear regressionequations were conducted for soil penetration resistance and shearstrength in combination with soil bulk density of the treatments. Thesestatistical relations and calculations revealed the greet response of soilphysical properties to the organic composting system supported withsuitable irrigation regime and soil biofertilization, indicating the essentialneed of calcareous soil management and its crop production, to suchtreatments.SUMMARY AND CONCLUSION125