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PHYSIOLOGICAL STUDIES ON BANANA UNDER SALT STRESS CONDITION

BY

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CONTENTS

1. INTRODUCTION

Banana (Musa spp.) is a tropical plant and was considered as one of the most popular and favourite, fruits in the world. Since, it has excellent flavour, nice taste and high nutritional value, in addition to some miscellaneus uses and a number of minor edible products.

In Egypt, the overall acreage of banana reached about 53607 Feddans in 1999 produced about 728999 tons of edible fruits (Ministry of Agriculture, A.R.E, 1999). This acreage mainly concentrated in the delta and the Nile valley 32841 Feddans as there is an ample water supply, which is needed to have good production. Nowadays there is a great plantation of banana in new reclaimed lands specially Noubaria as the acreage reached 20752 Feddans in 1999 (Table 1).

Table (1): Area and production of banana in 1999 (Ministry of Agriculture, A.R.E.).

	Total area (Feddan)	**Production (ton)**
Lower Egypt	14831	192651
Middle Egypt	5877	75232
Upper Egypt	12133	147695
Total	32841	415578
New Valley	12	99
Noubaria	20752	313322
Total	20764	313421
Grand total	53607	728999

From the botanical view, banana plant was considered as a herbaceous misophytic plant. Fast growth rate in nursery and field make

the plant more sensitive to water stress than many other fruit crops. Hence, water is often a limiting factor which the banana plant has a reputation for needing a plentiful supply of water for high production (Simmonds, 1966). In addition, water economization may be of great urge in the following decade due to the ecological changes in the area of the Nile resources in the past years. One of the possible solutions is the use of low quality water such as underground and the drainage water.

To sum up the concept of this study, it was pointed out that it is an ecological approach for problem solving and an evaluation of some responses of one of the most economic important fruit plants in Egypt to salinity stress conditions.

Therefore, the main goal of this investigation was to explore the possible effect of different levels of salinized irrigation water applied to banana plants on their growth and some chemical contents, in addition to anatomical structure of roots and leaves as affected by high levels of salinity treatments.

2. REVIEW OF LITERATURE

The review of literature concerning the effect of salinity on growth and chemical content in some fruit species could be subjected under the following topics:

1. Physiological effects of salinity:

As for the osmotic effect of salinity, Wilcox *et al.*, (1951) revealed that the osmotic pressure of the solution may be high enough to limit the availability of water to the plant beside the high concentration of salts in the solution may facilitate the uptake of one or more of ions, so that the accumulation may result and cause derangement of the normal metabolism of plant.

Regarding the effect of osmotic solutions of various salts, there are two opposite opinions : the first is that the osmotic solutions cause similar reduction in growth (Bernstein and Hayward, 1958); the second is that the osmotic solutions do not always affect the plants equally.

Epstein and Jefferies, (1964) showed that water is removed from the soil due to soil surface evaporation and plant transpiration; thus salt concentration of the soil solution at the root zone rises up twice to five times than in the irrigation water.

Meiri and Poljakoff, (1970) noticed that the rate of water entry into plants depends on both water potential gradient and root resistance. The diffusion gradient between medium and roots decreased appreciably as the osmotic pressure of external solution increase that resulting in apparently reduction in growth and transpiration of plants.

Salinity damage is mostly due to the presence of both CL and Na ions in soil or irrigation water (Alexandrescu and Blanaru, 1970). In accordance, El-Hammedy *et al.* (1995) suggested that Volkamer lemon seedlings could tolerate salinity stress as it contained the lowest values of Na and Cl, meanwhile sour orange could be considered as highest susceptible to salinity as it had the highest leaf Na and Cl contents.

Bernstein *et al.*, (1972) mentioned that the mechanism of plant injury, in case of specific ion toxicities, may involve injury to plant regulatory system. Accumulation of Cl or Na ions in the plant leaves is believed to affect stomatal closure, causing excessive leaf injury symptoms similar to those of drought damage.

Ayers, (1977) established that specific ions of relatively low concentrations have a direct toxic effect on sensitive crops. The toxic include mainly boron, chloride and sodium.

When the total quantity of salts in the irrigation water is higher enough that salts accumulate in the crop root zone, a toxicity problem occurs due to certain constituents in the water such as boron, chloride and sodium (Westcot, 1979).

Henceforth, Steinhardt, (1989) revealed that rise in salinity reduced the trees ability to absorb water and minerals.

2. Effect of salinity on plant growth and productivity:

On field grown bananas (cv. *Dwarf cavendish*), Israeli *et al.*, (1986) irrigated it with saline water for 2 years at 4 concentrations, they found that increased salinity led to a marked decrease in growth and productivity. A delay of 35 days in shooting time and a 49% decrease in bunch weight