



# INTRODUCTION

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Citrus is one of the most important fruit crops in the world and ranked the second after grape. In Egypt, citrus ranks the first of fruit crop production and most of attention is given to enhance its cultivation by many horticulturists. Citrus acreage is about 355518 feddans represents 34.24% out of the total area which amounted about 1038325 feddans according to the latest statistics of the Ministry of Agriculture, Egypt (1999)\*. Thereupon, strenuous efforts have always been extended to enhance citrus production through a better understanding of its nutritional requirements and fertilization program, *i.e.* source, rate and application method of fertilizers. It is well known that more than 40% of production costs is devoted to nutrition practices. Besides, the need for fertilizers particularly nitrogen fertilizers is in a continuous demand to compensate the reduction of soil fertility that resulted from intensive cultivation over the years and the depletion of loamy colloids after building the High Dam.

On the other hand, the chemical fertilizers have been extensively used before the First World War. By that time, the main source of minerals for plant nutrition was organic matter. The Chili salt used during the World War as an explosive material was used latter after the war as chemical fertilization, which opened the area of extensive use of chemical fertilizers in Agriculture. Over the years, the heavy use of chemical fertilizers have resulted in serious problems in the soil. It is not only the salinity, but also and more importantly the pollution of the underground waters and the accumulation of the chemicals in plant tissue that is a major components of animal fodder human diet. As a result of misuse of chemical fertilizers, the

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\*Statistics of the Ministry of Agriculture, Egypt (1999).

natural biological balance in the soil is disturbed. Organic manure fertilizers are the best alternative for chemical fertilizers. Organic manures are composed mainly of wastes and residues from plant and animal life. They contain much carbon and relatively small percentages of plant foods usually those come from plants that fixed the carbon. Organic manures supply some nutrients for plants and the carbon containing compounds are food for small animals and microorganisms. Manures often improve the structure of soils; they may do this directly through their action as bulky diluents in compacted soils or indirectly when the waste products of animals or microorganisms cement soil particles together. These structural improvements increase the amount of water useful to crops that soil can hold; they also improve aeration and drainage and encourage good root growth by providing enough pores of the right sizes and preventing the soil becoming too rigid when dry or completely over logged and devoid of air when wet. There are several sources of organic manure, but the most used every where are cattle manure, poultry and rabbit manure.

Furthermore, the use of biofertilizers was suggested to be one possibility to restore the natural conditions. Biofertilizers mainly consists of beneficial microorganisms that can release nutrient substances from rocks and plant residues in the soil and make them available for economical plants. A variety of such materials is now available commercially. Specific strains are used as biological fertilizers for nitrogen, phosphorus and silicon. N-fixing bacteria are considered one of the most important beneficial microorganisms. Rhizobacterien and Nitrobien could be used as sources for fixing nitrogen in the soil. The use of bacteria in combination with organic fertilizers results in encouraging yields and helps to keep the environment clean for coming generations.

Therefore, the main target of this investigation is to study the effect of organic manure source namely cattle, poultry and rabbit manure and the method of organic manure application, *i.e.* surface and trench as well as materials of N-fixing bacteria namely Rhizobacterien and Nitrobien, besides their interactions on tree growth, fruiting and fruit quality of Washington navel orange.

