POLLUTION OF THE AGRICULTURAL ENVIRONMENT IN EL-SAFF AREA, GIZA AND ITS EFFECT ON THE DETERIORATION OF PLUM TREES

BY

OMIMA MOSTAFA EL-SAID

(B.Sc. Agric., Horticulture, Ain Shams Univ., 1979)

THESIS

Submitted in Partial Fulfillment of
the Requirement for the Degree of

MASTER OF

ENVIRONMENTAL AGRICULTURAL SCIENCE

TO

INSTITUTE OF ENVIRONMENTAL STUDIES AND RESEARCH

AIN SHAMS UNIVERSITY

1994

APPROVAL SHEET

POLLUTION OF THE AGRICULTURAL ENVIRONMENT IN EL-SAFF AREA, GIZA AND ITS EFFECT ON THE DETERIORATION OF PLUM TREES

BY

OMIMA MOSTAFA EL-SAID

(B.Sc. Agric., Horticulture, Ain Shams Univ., 1979)

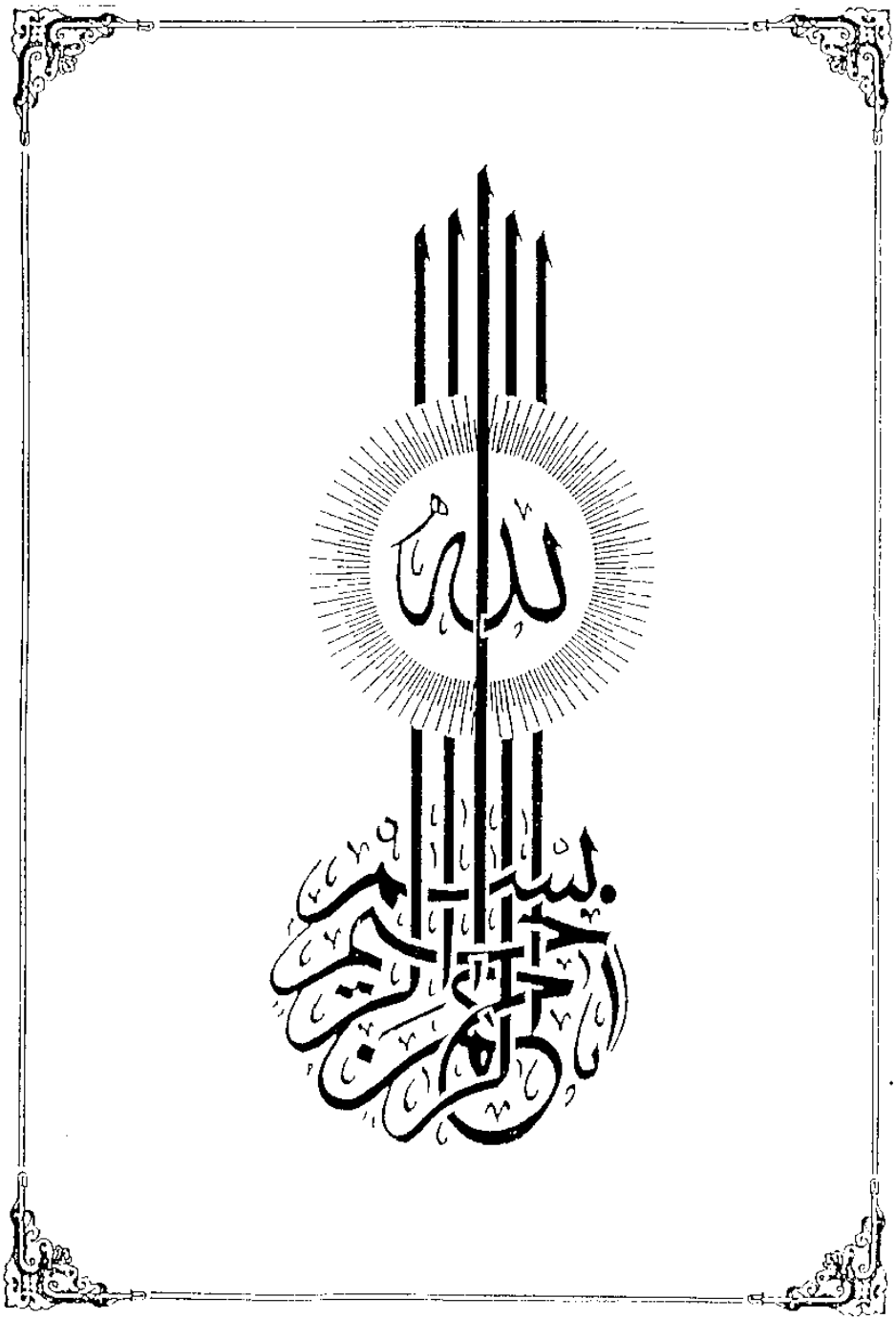
This thesis for M.Sc. degree has been approved by:

Prof.Dr. N.S. ERIAN N.S. Erian
Prof. of Agricultural Bio-chemistry,
Mansoura Univ.

Prof.Dr. M. ABOU RAWASH M. Abou Rawash
Prof. of Pomology,
Ain Shams Univ.

Prof.Dr. F.G. MOAWAD F. G. Moawad
Prof. of Agircultural Bio-chemistry,
Ain Shams Univ.

Date of examination: 24/11/1994



POLLUTION OF THE AGRICULTURAL ENVIRONMENT IN EL-SAFF AREA, GIZA AND ITS EFFECT ON THE DETERIORATION OF PLUM TREES

BY

OMIMA MOSTAFA EL-SAID

(B.Sc. Agric., Horticulture, Ain Shams Univ., 1979)

Under the supervision:

Prof.Dr. F.G. MOAWAD
Prof. of Agricultural Bio-chemistry,
Faculty of Agriculture,
Ain Shams University.

Prof.Dr. A.A.M. HUSSEIN
Prof. of Pomology,
Desert Research Center.

Dr. H.I. EL-KASSAS
Lecturer of Environmental Agricultural Science,
Ain Shams University.

ABSTRACT

The investigated areas are located in El-Saff, Giza governorate southward the industrial complex of Helwan. There are many sources of pollution in this area and the obtained data showed that these sources cause the contamination of irrigation water, soils and air (dust). At the same time, the three main types, which mentioned later, has markable effects on the plum trees. The effect could

be noticed on the physiological, physical and chemical properties of leaves of plum trees. Morphological and chemical analyses were carried out on the fruits of plum trees.

An increase in peroxidase activity, in leaves and fruits, was shown to be a sensitive indicator of air pollution injury by various pollutants to many trees, however, the increase occurred before visible symptoms appeared.

On the long run, as it is expected, these factors affect correspondingly the fruits of trees which are considered the most important economic production in this area.

CONTENTS

INTRODUCTION

I. INTRODUCTION

Pollution is defined generally as any change in the physical, chemical, and / or biological conditions of the environment which may harmfully affect the quality of human life. Pollution is usually treated in three natural interacting environmental categories namely air, water, and soil pollutions.

The resulting accumulated wastes may be mixed with open-water resources, leading to high levels of water pollution. The effects of mixing agricultural run off containing wastes, pesticides, and fertilizers in the rural water sources needs consideration. Currently, most of domestic fuels are from non-commercial sources: firewood, animal dung and agricultural wastes, even if reduced, this could lead to soil and air pollutions. Therefore, land protection is nowadays considered the most urgent problem associated with industrial progress and civilization development of societies. Water and soil pollutions, as well as air pollution may be due to the industrial factories which lie around the agricultural land.

Numerous localities of Egypt are known as polluted areas, especially those in immediate neighborhood of industrial communities and alongside highways.

However, Helwan was previously considered as one of the areas that supplies Cairo with vegetables and fruits. In

addition, it was considered as one of the important areas for health-care tourism because of aridity and mineral springs. The industrial areas in the A.R.E. where iron and steel industries, coal, cement, and chemicals factories are there.

These industries cause an environmental pollution (of air, water and agricultural lands) that leads to a reduction of the agricultural production.

For this reason among others, the aim of this investigation is to study the industrial pollution from Tebein to El-Saff areas (20 km), Giza governorate and to study effect of water and soil pollution on the deterioration of fruit productivity of plum trees. This investigation includes also determination of heavy metal contents and the extractable forms of such microelements in soils, plant samples, and polluted and non polluted irrigation water. The effect of heavy metals and industrial refuse of soils on morphological, physical and chemical properties of fruits were also accomplished.

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

a. SOURCES OF ENVIRONMENTAL POLLUTION:

Pollution is caused when a change in physical, chemical or biological conditions in the environment effect harmfully on the quality of human life including the effects on other animals and plants. As well as, there are several sources of pollution, but atmosphere is considered to provide the route through which pollutants, discharged in smoke and fumes, contaminate vegetation and other terrestrial surfaces. The most significant sources and forms of pollution, as reviewed in the literature, can be summarized as follows:

Anon (1974) indicated that until recent times, man and his activities could be considered just one among the many natural processes that are constantly modifying the state of biosphere. Today, however, humanity as a whole has become a powerful geological force. Changes which have taken place in the biosphere over recent decades when the accelerating human activity are comparable in scale with natural changes occurring over periods of million years. In addition, **Otter *et al*** (1985) reported that the main sources of air pollution are the use of fossil fuel for heat and energy production processes as well as the final use and disposal of many industrial products. Major components include sulphur dioxide and nitrogen oxides, as well as less specific pollutants such as particulates and

hydrocarbons. Chemical reactions in the atmosphere lead to formation of secondary pollutants such as sulphuric acid, nitric acid, ozone and photochemical oxidants. They added that important minor constituents are trace elements and polycyclic aromatic hydrocarbons which are transported and deposited in the same way as the sulphur and nitrogen compounds.

In addition, the primary environmental contaminants produced by agriculture are agrochemicals, in particular pesticides and fertilizers. These are deliberately introduced into the environment by farmers to protect crops and livestock and improve yields. Contamination is also caused, though, by the various wastes produced by agricultural processes, in much the same way as occurs in industry. The wastes comprise straw, silage effluent and livestock slurry, and, in the Third World, the wastes from farm processing of agricultural products such as oil palm and sugar. From the immediate environment of the farm contamination spreads to food and drinking water, to the soil, to surface and groundwaters and to the atmosphere, in some instances reaching as high as the stratosphere as stated by **Conway and Pretty (1991)**.

Concerning pollution with trace metals, **Caro (1964)** pointed out that there are five sources of trace elements, viz., aerosols, pesticides, limestone and phosphate fertilizers, manures and sewage sludges and mine wastes. In this connection **Thornton (1981)**, mentioned a number of man's

activities which effect on raising soil heavy metals above the natural background. Some of these activities are smelting activities, fertilization, vehicle emission, application of various urban and industrial waste products, and emission of contaminated smokes and dusts. Whereas, **Smith (1973)** showed that the trace elements include a large number of elements in the environment. Only a few of these can cause plant injury under certain environmental conditions, thus earning a designation as a trace element pollution. The number of such elements that are known to be injurious as atmospheric pollutant is even small. Sources of these pollutants are seemed to be metal or deposits, mining, smelting, and other industrial operations, or pesticide use. Emissions from coal-fired power plant may also contribute to the trace element content of vegetation in the vicinity **(Wangen and Turner, 1980).**

Finally, **Nassralla and Ali (1991)** surveyed the air pollution sources and divided them into two main categories: The first is the fuel combustion sources, *i.e.*, electric power stations, furnaces, boilers, vehicles, burning of garbage and others. Through those sources various pollutants are generated among which the following are the most significant: carbon monoxide, nitrogen oxides, sulphur oxides and polymerized gaseous hydrocarbons. The second is industrial sources which include hundreds of pollutant types starting from those