MORPHO-CYTOLOGICAL EFFECTS OF SOME FUNGICIDES ON VICIA FABA BROAD BEAN AND SOY BEAN

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By
NAHLA OSMAN MOHAMED EHSAN

Supervised By
Prof. Dr. AMAL SHEHAB
FROFESSOR AND HEAD OF BOTANY DEPAT.

Prof. Dr. ZAKIA ADAM
PROFESSOR OF BOTANY

BOTANY DEPARTMENT
UNIVERSITY COLLEGE FOR GIRLS
AIN SHAMS UNIVERSITY
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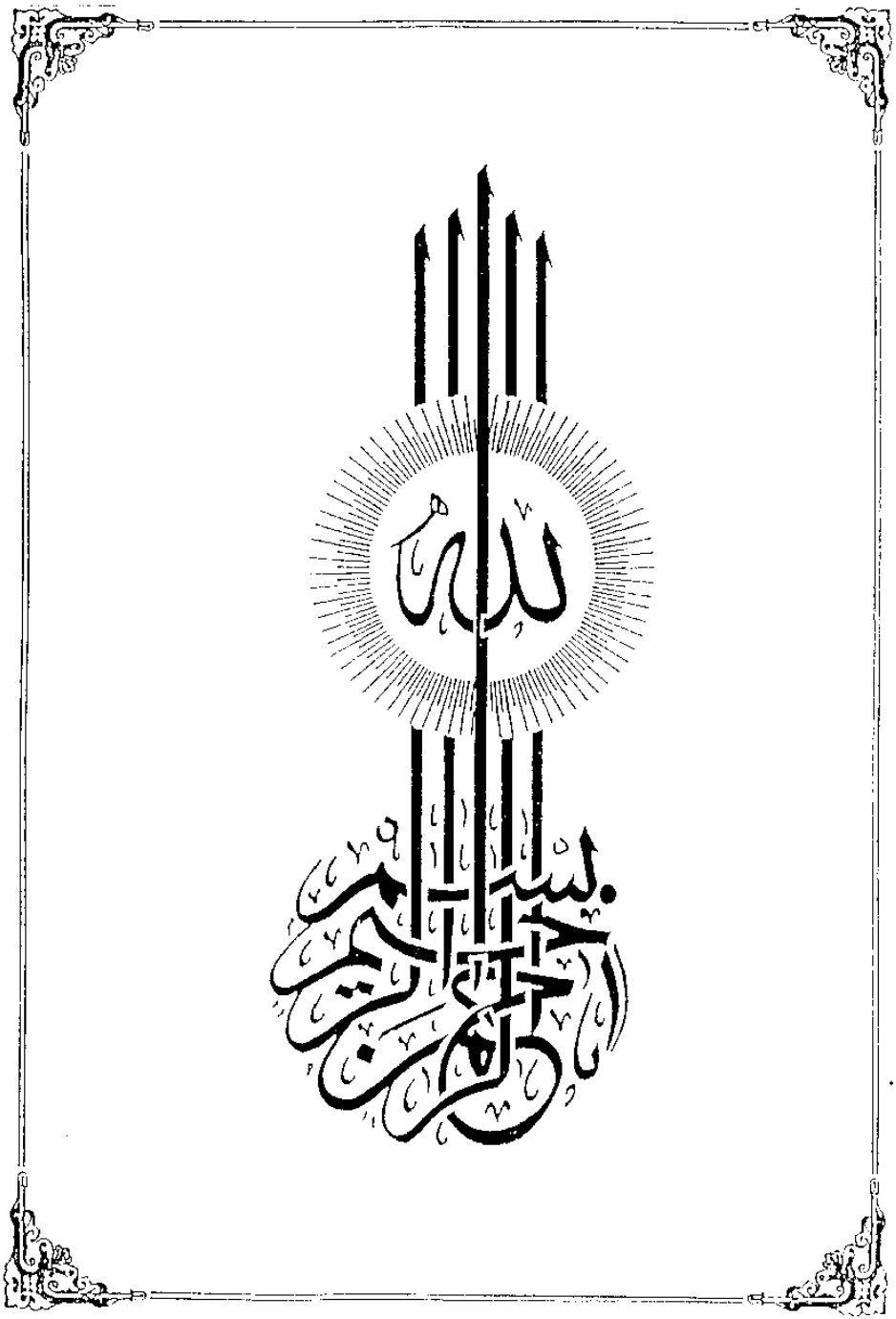

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APPROVAL SHEET

Name : NAHLA OSMAN EHSAN

Title: Morpho-Cytological effects of some fungicides on Vicia faba and Soy bean

This thesis has been approved by:

1. Professor Doctor

2. Professor Doctor

NOTE

The candidate passed successfully the examinations in the following courses;

1 - Special Courses .

Cytology

2 - Methodology .

3 - Statistics .

4 - English Language .

INTRODUCTION

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The wide spread use of agrochemicals in pest control directed the attention of many scientists to follow their effects on the crop itself to evaluate their application.

The study of the effect of various chemicals either organic or inorganic on morphology and cytology of Vicia faba and Soy bean plants, dates several years back because of their great economic importance. In addition, regular application of pesticides has been cited as a possible source of genetic damage leading to instability (Unrau and Larter (1952), Suneson and Jones (1960), Liang et al (1969), Lee et al (1974), Adam (1975), Farah and Adam (1979), Shehab et al (1984), and Adam et al (1990).

Agrochemicals inducing chromosomal alterations are widely known in crop plants eg. Laxynil on root tip cells of Vicia faba and Pisum sativum (Rost et al (1977), Fluometuron on roots of wheat and broad bean (El-Sadek and Ashour (1978), stomp on roots of Allium cepa (Mousa (1982), glean on roots of Allium cepa and Vicia faba (Badr and Ibrahim(1987).

It has been found that all of these pesticides in addition to others were antimitotic - mitotic index depressants and caused various types of mitotic aberrations such as c-metaphase, multipolarity, bridges and laggards. The negative effect of the pesticides on the crop plants on the cytological level may be referred to one or more of the following:-

A) The direct effect on the hereditary unit - DNA molecule - or its precursors.

This type of effects brought about deviations in rate of cell division expressed as mitotic index or meiotic rate of divisions away from the normal values. An effect which has been scored by a number of cytologists among them are the following:-

Wilson (1950), Hakeem and Shehab (1970 & 1973), Davidse (1973), Amer (1973) Amer and Farah (1974), Hakeem et al (1975), El-Bayoumi et al (1978), Farah and Adam (1979), Shehab and Adam (1981 & 1983), Dekergammeaux et al (1983), Adam and Rashad (1984), Amer et al (1987), Adam and El-Nahas (1988), Grover and Malhi (1986), Rao et al (1988) Adam et al (1990), and Ebad et al (1990).

B) The spindle mechanism may also be affected through binding of the pesticide with the proteins composing the spindle fibers - Tubulin - thus hindering their normal organization. This type of mode of action leads to a special type of abnormalities called the spindle disturbancy or spindle poisoning according to which an unusuel chromosome orientation and distribution occurred. This type of abnormality was described by (Deysson (1968), Dimetrova (1978), Amer and Michael (1983), Shehab and Adam (1983), Gomez - Arroyo et al (1985), Amer et al (1988), and Adam et al (1990).

C) Another mode of action is that affecting centromere, and chromosome directly leading to the phenomenon of lagging and chromosome breakage. The breaked chromosomes may reunited giving rise to bridges other than those sticky bridges which are the out come of stickiness. Micronuclei may also occure because of chromosome fragmentaion or lagging. Ravindran (1971), Shaik and Godward (1972), Anantha (1980) reported such phenomena. In addition, Somashekar and Gowda (1984), found that vitavax induced break, fragments, laggards and bridges in Allium cepa.

D) In addition the disturbance in cell division may arise from the effect of the substance applied on time course of each division by lengthening or shortening of the time needed for a specific stage. The end result of that effect is the phase accumulation.

The fungicides Vitavax, vitavax Captan, and vitavax thiram are used in broad bean and Soy bean fields to protect the crops against root rot fungi. Studies concerning their effects on some growth and yield characters were reported such as their effects on nodulation, plant growth and nitrogen content, of these reports are the following:

Fisher (1976), mentioned that captan, dodone and carboxin inhibited the growth of R, Trifolii. The growth of Soy bean was slightly affected by seed treatment with benomyl, thiram and captan, Abel (1977). It was reported also that thiram did not decrease the percent of nodulation in alfalfa spergon while it was toxic to berseem clover. Also, it was less harmful to peas and Soy bean, and even simulatory to cow pea (Balaraman prasade(1972), Latch and greenwood (1964). Vitavax captan T, vitavax thiram and orthocide 83, did

not induce bean - nodulation, Agrosan G. N. and thiram completely inhibited nodulation, Abo Neama (1978). On the other hand, Mohamed et al (1970) reported that, the fungicide captan seemed to stimulate nodulation, dry weight and total nitrogen of faba bean and lentil plants.

An adverse result was issued by (Loutfi et al, (1980) who found that benlate and vitavax captan had depressing effect on nodulation, dry weight and nitrogen content of Soy bean plants. Also Mallik and Tasfai (1985) said that Carboxin and Carboxin + captan at tow time recommended levels proved to be determinantal to nodulation and nitrogen fixation. From the previous review it is clear that, no reports were scored on the effect of the fungicides vitavax (carboxin), vitavax Captan and vitavax thiram on cell division of Vicia faba plant while these fungicides were applied in bean fields, because of the great economic importance of Vicia faba plant in Egypt. This study aimed to elucidate some morphological and cytological effects of these three widely used carboxin fungicides, Vitavax, vitavax captan, and vitavax thiram.

Effects of the three fungicides were followed cytologically in Vicia faba root tips and flower buds.

The cytological study aimed to assess the effect of the fungicides of various concentrations, and time durations on both mitotic and meiotic divisions of Vicia faba. The treatments were direct to root tip cells and flower buds in addition to an indirect treatment where the seeds were treated, cultivated and then left to the flowering stage. In addition the effect of recovery of the treated root tips for (24 h) was tested.

Discussion of the data obtained aimed to show the point of effect of the fungicides tested through analysing the different data and correlating them with the different points of view reported by other cytologists.

MATERIAL AND METHODS

MATERIAL AND METHODS

The present study was carried out on seeds of Vicia faba (C.V. Giza 2), and Soy bean (C.V. Williams). Three systemic fungicides (Vitavax, vitavax captan, and vitavax thiram), which contain a carboxin group were under test.

The fungicides were manufactured by the uniroyal chemical, U.S.A. They are used to protect plants against root rot fungi. The recommended dose was 3 gm/1 kgm seeds. The chemical constitutions of the three fugicides were as follows:-

1- Vitavax (carboxin): 5,6 dihydro-2-methyl-1,4-oxathiin-3, carboxinilide.