CHEMICAL CONTROL OF LEAFMINER *Liriomyza trifolii* (Berguss) AND RUST CAUSED BY *Uromyces appendiculatus* (Pers) IN KIDNEY BEAN FIELDS WITH REFERENCE TO RESIDUE ANALYSIS OF THIOCYCLAM AND DINICONAZOLE

By

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ABSTRACT

The present work aimed to search the following points: Biological activity of certain insecticides against leafminers larvae, efficacy of certain insecticides against leafminers larvae on kideny bean plants, efficacy of certain fungicides against *Uromyces appendiculatus* which cause rust disease on kideny bean plants,study some physical and chemical properties of thiocyclam (Evisect-S ٥٠ % WP), diniconazole (Sumi-٨ ٥ % EC) and oxycarboxin (plantavax ٢٠٪ EC) and their mixtures, efficacy of thiocyclam, diniconazole, oxycarboxin and their mixture against the fungus *Uromyces appendiculatus* and leafminer on kideny bean plants, effect of temperature, ultra violet and direct sunlight on the stability of thiocyclam and diniconazole, determination of thiocyclam and diniconazole residues in green pods of kideny bean and identification of photodecomposition products of diniconazole by GC-MS.

The most important results obtained can be summarized as follows: abamectin was more effective with $LC_{٥٠}$ = ٠,٤٤١ ppm than the other tested insecticides against *Liriomyza trifolii* larvae in laboratory. While diazinon was the least one $LC_{٥٠}$ = ٢٥,٠٥٣ ppm, bancol, Evisect-S and Tracer were more effective in decreasing number leafminer larvae than other treatment after two days of application in field evaluation. While on the basis of the mean of average number leafminer larvae, the highest effectiveness was found with Evisect-S and Bancol in the field evaluation. Results obtained from season ٢٠٠٧ were consistent with those obtained before in ٢٠٠٦. It can be concluded that, neresistoxin group could be included as a useful tactic in a comprehensive leafminer management programs in Egypt, result indicated that treatment with plantavax was more effective in decreasing sevirty disease of rust on kideny bean while micronized micronate was the least one, after ١٤ days spraying, results indicated that treatment with micronized Micronate followed by any fungicide was more effective than treatment with micronized micronate alone, treatment with Plantavax give highest yield of green pods of kideny bean while treatment with micronized Micronate gave the least yields of green pods of kideny bean, data revealed that tank mixture of pesticide thiocyclam with oxycarboxin or diniconazole was compatible of their physicochemical properties, data revealed that thiocyclam and diniconazole unstable at ٥٠, ٦٠ and ٧٠ c. The thermodecomposation rate of thiocyclam was more rapid than that of diniconazole. The half-life of thiocyclam and diniconazole were ٠,٧٦ and ٣,٨٥ hrs respectively, when exposure to sun light but ١,٥٨ and ٣,١ hrs when thiocyclam mixed with diniconazole and the half-life were ٠,٢٤ and ٠,١٦ hr when exposure to ultra-violet and ٠,٤٥, ٠,٢٨ hr in mixture toghther and the initial deposit of diniconazole on green pods common bean was slightly higher than that of thiocyclam. It was ٠,٠٤٥٧, ٠,٠٣٢١ ppm, respectively. The amounts of thiocyclam decreased sharply in green pods from zero to one day after application to reach ٠,٠٠٧٩ ppm with a very high loss of ٨٢,٧١. The calculated half-life periods of thiocyclam and diniconazole on green pods were ٠,٤٣ and ٢,٣٣ day, respectively after treatment.

Key words: kideny bean, Leafminer, rust, thiocyclam, diniconazole, biological activity, photodegradation, residue.

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CONTENTS

INTRODUCTION

Kidney bean, *Phasealus vulgaris* (L.) is cultivated in large scale areas in Egypt for export or local consumption. The kidney bean fly *Liriomyza trifolii* (Berguss) (Diptera: Agromyzidae) is one of the most important pests attacking kidney bean plants. Both larvae and adults cause damage, where larvae primarily mine the palisade mesophyll and the adult puncture both upper and lower leaf surfaces to feed and lay eggs (Parrella and Keil, ١٩٨٤). This species has an impact on many field crops in Egypt, especially kidney bean which is among the most economically important crops affected. It is problematic on vegetable crops because of its short life cycle, polyphagy and high fecundity (up to over ٦٠٠ eggs per female) (Parella, ١٩٨٧). It has ability to develop resistance against insecticides (Bethke and Parrella, ١٩٨٧ and Civelek, ١٩٩٩).

The threshold in USA is four mines of *L. trifolii* per terminal three leaflets (Schuster and Beck, ١٩٨٣), while chemical control in South Africa start when there are six mines per ٢٤ plants (Kotze and Dennill, ١٩٩٦). In Egypt, insecticides were applied when the percent of infestation reaches ٥٪ according to the recommendations of the Agriculture Ministry. Mostly, growers conduct multiple applications of insecticides in an attempt to completely eliminate the leafminers without consideration of the thresholds. Kelany *et al*., (١٩٨٦) found that pyrethroid; Rup ٩٦٢ and Zolone decreased the percentage of infestation of leaf miner, *L. congesta* in broad bean. Attiah (١٩٩٠) reported that fenitrothion and pirimiphos-methyl offered a fairly good control to *L. trifolii* infesting lentil. Buxton and MacDonald (١٩٩٤)

found that cyromazine and abamectin were very effective against larvae of *L. hidobrensis* attacking ornamental plants. Omar and Faris, (٢٠٠٠) found that Reldan, Evisect-S and Vertemic offered a fairly good control to *L. trifolii* infesting snap beans.

On the other hand, kidney bean is heavily infected with rust, ascochyta leaf and powdery mildew diseases, which cause considerable loss. Rust disease caused by *Uromyces phaseoli* Pers. is the most destructive foliar disease. Although, the symptoms are more abundant on the underside of the leaf but they can also be found on petioles, pods, stems and the upper leaf surface (Junior *et al.*, ٢٠٠١). Early diagnosis and treatment are critical factors for kidney bean rust management.

Most Florida beans are sprayed heavily with Ethylene bis dithiocarbamate (EBDC) fungicides such as maneb or zineb (Pohronezny *et al.*, ١٩٨٨). Fungicide trials in Nebraska during the ١٩٨٠s and early ١٩٩٠s provided data to develop a model that predicated ١٩ kg/ha decrease in yield for each ١٪ increase in disease severity of rust (Lindgren *et al.*, ١٩٩٥). Khaled *et al.*, (١٩٩٥) observed that the tested fungicides separately or with Dithane M-٤٥ offered a sufficient protection against faba bean diseases (chocolate spot, alternaria leaf spot and rust) and increased seed yield over the control. Khafagi *et al.*, (١٩٩٥) reported that pea rust was epidemic for the first time in Egypt during season ١٩٩١/١٩٩٢ showing ٨٠٪ severity and found that spraying pea plants at the beginning of rust disease at ١٤ days intervals (٤ sprays) with Alto or Sumi-eight decreased disease severity and produced economic yield. Singh and Bhat, (٢٠٠٢) found

that hexaconazole alone or in combination with Mancozeb was highly effective in both evaluation years (١٩٩٨ and ١٩٩٩) and carbendazim was least effective against French bean rust disease. It is a common phenomenon in some fungi to develop resistance or tolerance to certain fungicides (Mussa ١٩٨٦). However fungicidal mixtures as well as diversifying the fungicides used in the consecutive sprays help preventing the build up of such resistance and attain a reasonable disease control. Kidney bean plants are heavy infested with leafminer, as well as with rust disease, which causes considerable loss. Thiocyclam use for control of leafminer (*Liriomyza trifolii*). The systemic fungicide diniconazole is widely used in kidney bean fields to control rust, caused by *Uromyces appendiculatus*.

Applying a tank mix of pesticide can save time, labor, energy and equipment costs. Pesticides combination usually alters plant absorption and translocation as well as metabolism and toxicity at the side of action of one or more of the mixed products. Not all changes are for the better. Negative effects were occurring such as reduced pest control, increased damage to non-target (plant phytotoxicity) and in compatibility problems between materials.

Tank mixtures are prepared in the field directly by farmer at short time before using. This type of mixing implies several lack information about the compatibility level of the components. Second, usually there is no idea about the most adequate proportion of the components. Third, the amount of the diluents in the tank increases so, the crop in receiving an overdose of diluents without having any idea about its consequences of negative interaction with the toxicants. So it

is important to study the physical, chemical and biological compatibility of pesticides mixtures, their residues in treated plants, their fate under the environmental conditions and the efficacy on the *Liriomyza trifoli* and *Uromyces appendiculatus*.

Karageorgiev (١٩٨٣) described the extraction and analysis method of thiocyclam residue in fruit tree species. The limit of detection was ٠,٠٠٢ mg/kg and the recovery rate for fresh apples and pears was ٩٢ and ٩٨٪. Amer *et al*. (٢٠٠٧) determinated diniconazole residue in tomatoes and green beans. The recovery was more than ٩٠٪. The fungicide decreased rapidly with a half-life around ٣ days into tomates and green beans.

Mahamoud and Eissa (٢٠٠٧) found that halfe-life values of diniconazole residues in pepper and cucumber fruits were ٢٠,٧١ and ٧٣,٧٩ hours in green house.

The problem of pesticides residues in food is causing great concern to national and international health authorities.

The objectives of the present study were:

١. Biological activity of certain insecticides to larvae of leaf miner *Liriomyza trifolii* in laboratory.
٢. Efficacy of certain insecticides against leaf miner larvae in kidney bean plants.
٣. Efficacy of certain fungicides against rust disease caused by *Uromyces appendiculatus* on kidney bean plants.
٤. Efficacy of thiocyclam (Evisect-S ٥٠٪ WP) and diniconazole (Sumi-٨ ٥٪ EC) alone or in mixture against the fungus *Uromyces appendiculaus*, and the leaf miner in kidney bean plants.

٥. Degradation study of Sumi-٨ and Evisect-S alone or incombination after exposure to sun light, ultra violet (UV) and temperature.

٦. Identification of the photodegradation products of diniconazole after exposure to sunlight using GC-MS

٧. Determination Evisect –S and Sumi-٨ residues in green pods of *Phaseolus vulgaris* at different intervals of application under field conditions.

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