ACARICIDAL AND INSECTICIDAL EFFICIENCY OF SOME RECOMMENDED CUPREOUS FUNGICIDES AGAINST SUCKING PIERCE PESTS

GEHAD M. MOUSA[1], SOUAD, M. ALSAQABI[2] AND AHMED G. EL-SISI[3]

[1]Plant Protection Res. Institute, A.R.C. Egypt.,
[2]Zoology Dep., Fac. Science for Girls, King Faisal Univ. KSA
[3]Central Agric. Pesticides Lab., A.R.C. Egypt.

ABSTRACT

Acaricidal and insecticidal efficiency of four different inorganic cupreous fungicides were tested against sucking pierce pests infested squash seedling which were: spider mite, *T. urticae* and insects: aphid, *A. gossypii*, whitefly *B. tabaci* and Jasside, *E. lybica*. The tested materials were: Champion 77% W.P. (copper hydroxide), copper oxychloride 50% W.P., Ridomil plus 50% W.P. (15% metalaxyl + 35% copper oxychloride) and Del cup 6% L (copper sulphate). The compounds were tested by one rate only (their recommendation rate as fungicides). Results obtained indicated that the tested materials showed successful acaricidal effect for controlling spider mite, and successful insecticidal effect for controlling aphaid, whitefly and jasside without no any phytotoxic effect on treated squash seedlings.

INTRODUCTION

Inorganic cupreous fungicides are used in wide range for controlling different types of fungus: downy mildews, late blight, leaf spot diseases....etc, infested vegetable crops that cause great loss in quality and quantity of produced crop. Also, copper element is considered a nutrient element necessary for different plants.

Previous studies for inorganic salts either for copper salts or other metallic salts proved efficient effect in controlling some key pests, i.e. snails (Nakhla and El-Sisi, 1995), cotton leafworm larvae (El-Sisi and Farrag, 1989), cotton leafworm pupae (Sharaby, 1987), cutworm (Bader *et al*, 1996), sucking pests (Mousa and El-Sisi, 2001).

Also, studies on foliar fertilizers consisted of inorganic salts indicated their pesticidal activity against different pests. Many researches indicated that foliar fertilizers were highly effective against insects and phytophagous, Narkiewcz *et al.*, (1989) and Nowosielski *et al*, (1988), in Poland, Alagarsamy and Bakshran (1986), in India, Reuveni and Reuveni (1995), in Israel, and Chen-xueten *et al.*, (1997), in China,

proved their effects against phytophagous insects.

In Egypt, Mohmed *et al.*, 2001, proved their activity against cotton leafworm, El-Sisi and Mousa, 2001, proved their pesticidal efficiency against sucking pierce pests and Salem *et al.*, 2003 proved their activity against aphids infested potato plants.

Therefore, the previous research indicated that inorganic cupreous fungicide may have acaricidal and insecticidal effects besides their fungicidal effect.

The aim of the present work is studying the acaricidal and insecticidal effect of four different inorganic cupreous fungicides against sucking pierce pests infested squash crop.

MATERIAL AND METHODS

The following fungicides were tested:

1. Champion 77% W.P.: The compound contained 77% a. i. (copper hydroxide), produced by Egytrol Chemical, USA, used at the rate of 250 g/100 L. water.
2. Copper oxychloride 50% W.P.: The compound contained 50% a. i. (copper oxychloride). produced by Chem Olibimix- Bodabest, used at the rate of 250 g/100 L. water.
3. Ridomil plus 50% W.P.: The compound contained 50 % a. i.(15% metalaxyl + 35% copper oxychloride) produced by Novartis Agro (Susera), used at rate 150 g/100 L. water.
4. Del cup 6% L: The compound contained 6% (copper sulphate), imported by Delta Co. Egypt, used at the rate of 250 cm^3/100 L. Water.

The experiment was conducted in the open field planted with squash seedling highly infested with sucking pierce pests: spider mite, aphid and whitefly in the farm of plant protection research institute, Dokki, Giza according to Ministry of Agriculture Protocol (1993). The area was divided into plots each have 7 rows of 3 meter long, three replicate (3 plots) were used for each treatment. Spraying was done using hand plastic 2L capacity on August 28, 2007 for the tested fungicide at their recommended rates mentioned before. Infestation was assessed before spraying and then after 1, 3, 5 and 7 days from spraying by collecting 10 leaves from each treatment. Inspection was done under binocular in laboratory to determine the number of each of the considered sucking pests per leaf which were: immature stages of white fly, nymphs and adult of spider mite, alive individuals of aphid and jasside. The pesticidal efficiency was calculated as reduction percentage occurred in the population of each pest as a result of treatment according to the equation adopted by Henderson and Tilton (1955).

$$T_a\%R = (1 - \frac{C_b}{C_a} \times) 100$$

where C_b= mean alive number of pest/leaf in untreated pot before spraying.

C_a^ mean alive number of pest/leaf in untreated pot after spraying.

T_b= mean alive number of pest/leaf in treatment before spraying.
T_a= mean alive number of pest/leaf in treatment after spraying.

On the other hand, phytotoxic effect was determined by recording any flamming, curl and colour changes occurred in leaf of squash seedling.

RESULTS AND DISCUTION

According to Ministry of Agriculture recommendation for natural materials used in controlling pests, succeeded copper containing pesticides against vegetable pests should achieve initial effect > 70% reduction after one day and residual effect > 40% reduction after 7 days.

Results in Table I about the acaricidal effect of the tested materials against spider mite *Tetranychus urticae* clearly indicated that the tested materials showed high successful initial effect (74.5-89.1%). Copper oxychloride showed the highest effect followed by Del cup, Ridomil plus and Champion. Also, they showed high successful residual effect (82-88.3%), Del cup showed the highest effect followed by Ridomil plus, Copper oxychloride and Champion.

TABLE (I)
Acaricidal efficiency of the tested fungicides against spider mite *Tetranychus urticae.*

Treatment	Pre-treatment count mean No./leaf*	Initial effect after 1 day		Residual effect after (No./leaf)			Total	Mean	% R**
		No./leaf*	% R**	3 days	5 days	7 days			
Champion 77% WP.	31.5	8.2	74.5	4.2	8.9	17.9	30.6	10.2	82.9
Copper oxychloride 50% W.P.	35.0	3.9	89.1	7.0	11.8	14.8	33.6	11.2	83.1
Ridomil plus 50% W.P.	28.4	6.7	76.9	2.7	8.0	10.7	21.4	7.1	86.8
Del cup 6% L	25.7	4.6	82.5	2.1	3.9	11.0	17.0	5.7	88.3
Control	35.2	36		46.2	66.1	88.0	200.3	66.8	

* No./leaf =mean alive pest/leaf.
** % R = %Reduction of a live pest according to Henderson and Tilton equation (1955).

Data in Table II about the insecticidal effect of the tested materials against aphid *Aphis gossypii* indicated that only Del cup gave high successful initial effect (85.2%) comply with Ministry of Agriculture recommendation, while the other compounds showed initial effect less than recommendation (between 62.6-69.3%), on

the other hand all the tested materials showed high successful residual effect (87.3-93.3%); Del cup gave the highest residual effect followed by Ridomil plus, Champion and Copper oxychloride.

TABLE (II)

Insecticidal efficiency of the tested fungicides against aphid *Aphis gossypii*

Treatment	Pre-treatment count mean No./leaf*	Initial effect after 1 day		Residual effect after (No./leaf)			Total	Mean	%R**
		No./ leaf*	%R**	3 days	5 days	7 days			
Champion 77% W.P.	25.3	10.9	62.6	5.0	7.7	12.1	24.8	8.3	88.1
Copper oxychloride 50% W.P.	22.6	8.0	69.3	5.2	7.0	11.4	23.6	7.9	87.3
Ridomil plus 50% W.P.	25	10.4	63.9	4.6	10.0	8.6	23.2	7.7	88.8
Del cup 6% L	27.4	4.5	85.7	1.4	5.9	8.4	15.7	5.2	93.1
Control	23	26.5		47.6	64.2	77.7	189.5	63.2	

Results in Table III about the insecticidal effect of the tested materials against whitefiy, *Bemisia tabaci* indicated that all the tested materials showed high successful initial effect (75-91%); Del cup showed the highest initial effect followed by Ridomil plus, Champion and Copper oxychloride. Also, they showed high successful residual effect (70.7-90.1%), Ridomil plus gave the highest effect followed by Del cup, Champion and and Copper oxychloride.

TABLE (III)

Insecticidal efficiency of the tested fungicides against whitefly *Bemisia (abaci.*

Treatment	Pre-treatment count mean No./leaf*	Initial effect after 1 day		Residual effect after (No./ leaf*)			Total	Mean	%R**
		No./ leaf*	%R**	3 days	5 days	7 days			
Champion 77% W.P.	37.4	9.4	77.0	4.8	11.9	18.7	35.4	11.8	77.9
Copper oxychloride 50% W.P.	32.5	8.9	75.0	7.7	13.9	19.1	40.7	13.6	70.7
Ridomil plus 50% W.P.	31.2	5.9	82.7	2.2	7.0	4.1	13.3	4.4	90.1
Del cup 6% L	37.2	3.8	91.0	3.4	9.6	14.2	27.2	9.1	82.9
Control	32.0	35		41.8	43.3	51.9	137.0	45.7	

Data in Table IV about the inscticidal effect of the tested materials against jasside, *Empoasca lybica* indicated that only Del cup and Champion showed successful initial effect (77.7 and 73.2% reduction respectively) while Ridomil plus and Copper oxychloride gave initial effect less than recommendation (63.9 and 57.4% correspondly). All the tested materials gave high successful residual effect (63.6 - 82.3%); Del cup showed the highest effect followed by Champion, Copper oxychloride and Ridomil plus.

TABLE (IV)

Insecticidal efficiency of the tested fungicides against *jasside Empoasca lybica.*

Treatment	Pre-treatment count mean No./leaf*	Initial effect after 1 day		Residual effect after (No./ leaf*)			Total	Mean	% R**
		No/leaf*	%R**	3 days	5 days	7 days			
Champion 77% W.P.	3.5	1.2	73.2	1.1	2.1	2.9	6.1	2.0	80.7
Copper oxychloride 50% W.P.	2.2	1.2	57.4	1.6	1.5	1.7	4.8	1.6	75.4
Ridomil plus 50% W.P.	2.6	1.2	63.9	0.4	4.6	3.3	8.3	2.8	27.2
Del cup 6% L	4.2	1.2	77.7	0.9	1.2	4.6	6.7	2.2	82.3
Control	2.5	3.2		4.4	8.1	9.7	22.2	7.4	

Conclusion:

The following conclusion could be obtained from the results shown in tables I, II, III and IV:

1. The acaricidal and insecticidal effect increased as period after spraying increased, therefore some of the tested materials which did not give suitable initial effect in some cases, gave high successful residual effect as result of increasing of exposure period.
2. Different forms of tested inorganic copreous fungicides: copper hydroxide (Champion), Copper oxychloride and copper sulfate (Del cup) showed already the* same acaricidal and insecticidal effect, therefore it could be concluded that the effect is due to copper element.
3. Besides the benefits of inorganic cupreous compound as fungicides and as a nutrient element for plants, it could be concluded a new use for these compounds as successful acaricides and insecticides.

Generally, the mode of action of the tested materials as the following: the toxic effect of inorganic copper salts is due to their effect as stomach and protoplasm

poisons (Spencer, 1968, Gleason *et al*, 1969 and Tomlin, 1994) and also may be due to losing a part of insect water content as a result of osmotic force (Steward, 1958).

REFERENCES

ALAGARSAMY, G and R. BAHASKARAN. (1986): Effect of foliar spray of macro and micro nutrients on sheath rot incidence and rice grain yield. *(International - Rice -Research- Newsletter, 11 4:27-28).*

BADR N.A., A.G. EL-SISI, S.M. RADWAN and S.M MOUSTAFA(1996): Evaluation of some inorganic salts for controlling the black cutworm, *Agrotis ipsilon (J. Agric Sci. Mansoura Univ., 21 (2): 773-778.).*

CHEN- XUEFEN; SUN- JIAODE; WU- GUANGTAN, JIN- JIANZHONG. MIGSEM (1997): Integrated management- Technology of citrus black spiny whitefly *(J. of Tea science, 17 (1): 15-20).*

El-Sisi, A.G. and R. M. Farrag (1989): Formulation and biological effects of copper carbonate against the Egyptian cotton leafworm, *Spodoptera littoralis (Agric. Res. Rev., 67 (1): 29-35).*

EL-SISI, A.G. and GEHAD M. MOUSA (2001): Foliar fertilizers as important alternatives in controlling agricultural pests *(1st conference for safe alternatives of pesticides, Assuit Univ. P. 71-81).*

GLEASON M.N., R.S. GOSSELIN, H.C. HODGE and R.P. SMITH (1969): Clinical toxicology of commercial products. Acute poisoning *(3rd the William and Co., Baltimore Eibrary of congress, catalog card number 68-22712, USA).*

HENDERSON C.F and E.W. TILTON (1955): Test with acaricides against brown wheat mite. *(J. Econ. Entomol, 48:157-161).*

MINISTRY OF AGRICULTURE (1993): Protocols of evaluation the efficiency of pesticides in Egyptian cultures, pp. 85.

MOUSA, GEHAD M., and A.G. EL-SISI (2001): Pesticidal efficiency of some inorganic salts against sucking pests infesting *phaseolous vulgaris* (L.) seedling. *(Egypt. J. Agric. Res. 835-845).*

MOHAMED, SONDOS A, A.G. EL-SISI and I.S. ABDEL-WAHAB (2001): insecticidal activity of some foliar fertilizers against cotton leafworm *Spodoptera littoralis* (Boisd). *(J. Agric Sci. Mansoura Univ., 26 (12): 8047-8052).*

NAKHLA, J.M. and A.G. EL-SISI (1995): Evaluation of some inorganic salts against the small garden snail: *Thebapisana* (Mulle). *(Egypt. J. Agric. Res. 73 (2): 365-379).*

NARKIEWICZ, J.J.; J. TOMCZAK and O. NOWOSIELSKI (1989): Plant protecting foliar fertilizers in pest control on vegetables. *(Biuletyn -waczywniczy, 1: 75-82).*

NOWOSIELSKI O; W. DZIENNIK; T. KOHINSKA; J. NAR KIEWICZ and J. DOBRANSKA (1988): A biological basis for the efficiency of plant protecting foliar fertilizers in vegetable production *(Acta Horticulture, 222: 105-116).*

REUVENI, M. and R. REUVENI (1995): Efficacy of foliar sprays of phosphates in controlling powdery mildews in field –grown nectarine, mango trees and grapevines. *(Crop. Protection., 14 (4):311-314).*

SALEM H.E.M.; R.E.M. OMAR and A.G. EL-SISI (2003): Effect of spraying potassium sulphate on two aphid species infesting cotton and potato plants. *(Annals of Agric. Sci. Moshtohor. 41 (4):1729-1735).*

SPENCER, E.Y. (1968): Guide to the chemicals used in protection *(5th ed.,Canada Dep. of Agric., pp. 483.).*

SHARABY, A. (1987): Screening of certain inorganic salts as possible sterlants against the lesser cotton leafworm, *Spodoptera exigua* (Hubn) by pupal treatment. *(Bull. Ent.Soc. Egypt, Econ. Ser., 16:269-282).*

STEWARD F.C. (1958): Plant physiology. *{Vol. (1). Plant in relation to water and salts. Academic Press, London}.*

TOMLIN C. (1994): The pesticide Manual. Incorporating the Agrochemical Handbook 10th ed.. *(The Royal Society of Chemistry, Crop Protection Publications, pp.1341).*