

LABORATORY AND FIELD STUDIES FOR DETERMINATION OF SPRAYING POTASSIUM SULFATE AGAINST GREEN BUG *Nezara viridula* (L.) AND LEAF HOPPER *Empoasca discipiens* (PAOLI) INFESTED TOMATO CROP.

Salem, H. El. M.* and A. G. El-Sisi **

*Plant Protection Research Institute Agric., Res. Center, Dokki., Giza.

**Central Pesticide Lab., Agric. Res. Center Dokki., Giza.

ABSTRACT

Two different experiments were carried out to evaluate the toxicity and insecticidal activity of the fertilizer, potassium sulfate against two species of green bug *Nezara viridula*, and leafhopper *Empoasca discipiens* (Paoli) infesting tomato plant. The first experiment was done in the laboratory to determine the toxicity of the tested material by spraying different concentration on tomato seedling in pots artificially infested with leafhopper and green bug while the second one was done in field to determine the insecticidal activity against leafhopper and green bug besides the phytotoxicity of potassium sulfate when sprayed at concentrations 0.25, 0.5 and 0.75% on tomato crop. Results obtained indicated that potassium sulfate showed high toxic effect against the two species of leaf hopper and green bug since LC_{50} were 8.9 and 8.6 ppm on green bug and leafhopper respectively, while the second experiment indicated that concentration 0.5% was suitable for controlling the two species of insect leaf hopper and green bug without any phytotoxic effect on tomato plant.

INTRODUCTION

Several researchers found that spraying formulated inorganic salts and foliar fertilizers caused high insecticidal efficiency against land snails (Nakhla and El-Sisi, 1995), cotton leafworm larvae (Abdel-Wahab and El-Sisi, 2000 and Mohamed et al., 2001), cutworm (Badr et al., 1996) and sap sucking pests (Mousa and El-Sisi, 2001). Since the soil fertilizer, potassium sulfate is considered an inorganic salt, therefore it could be predicted that it may show suitable insecticidal activity against sucking pests if used as spray solution on plants. It should be mentioned that potassium sulfate causes increases to vegetative growth infestation with green bug and leafhopper when used as fertilizer. This effect is due to its metabolism and interfering in biological reactions in plants, while in case of its spraying on to plants, it directly contacts pests and affects on them as inorganic salt. Continuing of these series of researches, the aim of the present work is studying the toxicity and insecticidal activity of potassium sulfate against to sucking pests species leaf hopper and green bug infesting tomato crop.

MATERIALS AND METHODS

Potassium sulfate contained 33% potassium sulfate, produced by Aboker Fertilizer Company was used in this study.

Toxicological study:

This study was done in the laboratory using spraying technique to be similar to what could be in the field, and in order to show all expected effects; i.e., contact, stomach, antifeeding.

Different concentrations of potassium sulfate in water; 0.25, 0.5 and 0.75% were prepared and sprayed using Normal Knapsack hand sprayer on tomato seedlings planted in pots and artificially infested with *N. viridula* and *E. discipiens*. Each concentration was sprayed on three pots. Percentages of mortality in adult stage were recorded after 24 hrs of spraying, was calculated L C 50,s in this study.

Filed experiment:

The experiment was conducted according to Ministry of Agriculture Protocol (1993), at 2007; in El-Housenia, Sharkia Governorate. Potassium sulfate at concentrations of 0.25, 0.5 and 0.75 % was sprayed on tomato plants of 30 days age and having suitable infestation by the two insect species green bug and leafhopper using 25L knapsack sprayer. The total area in this experiment was ½ Feddan Each concentration was applied on 3 replicates, each occupied 1/100 F. spraying started on 10 March 2007. Tomato used. Infestation was assessed before spraying and after 2, 5, 8, 11 and 14 days after spraying. Insecticidal activities was determined by random picking of 15 leaves from treated and untreated plants. Inspection was done under a binocular stereomicroscope in laboratory to determine the number of each alive type of two insects per leaf. The insecticidal efficiency was calculated as a reduction percentage occurred in the population of each pest as a result of treatment according to the equation of Henderson and Tilton (1955).

On the other hand, phytotoxic effect was determined by recording any flaming, curl and colour changes occurred in the leaves of seedlings.

RESULTS AND DISCUSSION

Toxicological study :

Results shown in Table (1) indicated that potassium sulfate showed highly toxic against the two species green bug *N. viridula* and leafhopper *E. discipiens* it gave at very low concentrations since 50 % mortality 8.9 and 8.6 ppm against green bug and leafhopper respectively. Therefore it could be expected that it will show good effects against two insects under field conditions.

Table (1): LC₅₀ values (ppm) of potassium sulfate against *N. viridula* and *E. discipiens*

Testing method	<i>N. viridula</i>	<i>E. discipiens</i>
Spraying	8.9	8.6

Field experiment:

Results shown in Tables (2 and 3) about the insecticidal effect of potassium sulfate sprayed at different concentrations against nymphs and

adults of two species of leaf hopper and green bug on tomato plants in field indicated that all tested concentrations showed good initial effect $\geq 70\%$ reduction and residual effect $\geq 40\%$ reduction agree with Ministry of Agriculture recommendations for alternatives (1993). Data indicated also that potassium sulfate had high protecting effect against the two species leaf hopper and green bug up to 14 days after spraying. The same tables showed also that nymphs of both species were slightly more susceptible to potassium sulfate than adults and the effect against the two species increased as concentration of potassium sulfate was increased.

Phytotoxic effect:

Field observations indicated that potassium sulfate caused slight phytotoxicity effect when it was sprayed at 0.75 % on tomato as it caused flaming and colour change in leaves. While, concentrations 0.25 and 0.5 % did not show any phytotoxic effect. This phytotoxic effect at concentration 0.75 % may be due to osmotic force that cause plasmolysis to plant cells by losing a part of its water content (Spencer, 1968,).

According to obtained results of insecticidal activity and phytotoxic effect, it could be stated that concentration 0.5 % was suitable for controlling the two insects species *N. viridula* and *E. discipiens* on tomato crop for its high insacticidal activity without showing any phytotoxic effect.

The obtained results agree with Mousa and El-Sisi,(2001) findings about foliar fertilizers against sucking pests, and comply with those of Mohamed et al , (2001) about the effect of foliar fertilizers against cotton leafworm. Results also agree with results on using inorganic salts against sucking pests land snails (Nekhla and El-Sisi, 1995) and cutworm (Badr et al, 1996). The insecticidal effect of potassium sulfate is due to its effect as stomach poison as retaining of mid-gut epithelium protoplasma (Gleason et al., 1969 and Tomlin, 1994). Also, the toxic effect may be due to losing a part of insect water content as a result of osmotic force (Spencer, 1968,), and may be also due to indirect mechanism that potassium sulfate increases natural plant immunity through improving the plant natural status.

Results proved that concentration 0.5 % of potassium sulfate may be recommended for controlling the two insect species *N. viridula* and *E. discipiens*, in addition to its benefits as nutrient elements for tomato crop.

Table (2) : Insecticidal efficacy of potassium sulfate against green bug infested tomato plants.

Concentrations (Wt./V.)	Nymphs		Adults	
	Initial Effect after 2 days	Mean residual Effect (%) R	Initial Effect after 2 days	Mean residual Effect (%) R
0.25	78.77	48.7	71.72	41.4
0.50	82.69	52.9	74.95	44.5
0.75	90.10	60.2	88.68	58.8

Table (3) : Insecticidal efficacy of potassium sulfate against leafhopper infested tomato plants.

Concentrations (Wt./V.)	Nymphs		Adults	
	Initial Effect after 2 days	Mean residual Effect (%) R	Initial Effect after 2 days	Mean residual Effect (%) R
0.25	86.12	55.6	80.66	50.2
0.50	86.53	57.4	80.82	52.6
0.75	91.33	62.1	90.33	60.4

REFERENCES

- Abdel-Wahab, I.S. and El-Sisi, A.G. (2000): Mineral salts as an alternative of conventional pesticides for controlling cotton leafworm : *Spodoptera littoralis* (Boisd.). J. Agric. Sci. Mansoura Univ., 26 (1) : 435-438.
- Badr, N.A.; El-Sisi, A.G.; Radwan, S.M. and Moustafa, S.A. (1996): Evaluation of some inorganic salts for controlling the black cutworm, *Agrotis ipsilon*. J. Agric. Sci. Mansoura Univ. 21 (2) : 773-778.
- Gleason M. N.; Gosselin, R.E.; Hode, H.C. and Smith, R.P. (1969): Clinical toxicology of commercial products. Aute poisoning. 3rd ed. The Williams and Wilkins Co. Baltimore. Library of Congress, catalog card number 68-22712, U.S.A.
- Henderson C. F. and Tilton, E. W. (1955): Test with acaricides against the brown wheat mite. J. Econ. Entomol. 48 : 157-161.
- Ministry of Agriculture. (1993): Protocols of evaluation the efficiency of pesticides in Egyptian cultures, P. 85 (in Arabic).
- Mohamed S.A.; El-Sisi, A.G. and Abdel- Wahab, I.S. (2001): Insecticidal activity of some foliar fertilizers against cotton, *spodoptera littoralis* (Boisd.). J. Agric. Sci. Mansoura Univ., 26 (12) : 8047-8052.
- Mousa G.M. and El-Sisi, A.G. (2001): Pesticidal efficiency of some inorganic salts against sucking pests infested *Phaseolous vulgaris* (L.) seedlings. Egypt. J. Agric. Res., 79 (3) : 835-845.
- Nekhla J.M. and El-Sisi, A.G. (1995): Evaluation of some inorganic salts against the small garden snail *Theba pisana* (Mulle). Egypt. J. Agric. Res., 73 (2) : 365-379.
- Spencer E.Y. (1968): Guide to chemicals used in crop protection. 5th ed., Canada Dept. of Agric., pp. 483. F.C. (1958): Plant physiology, vol. II. plant in relation to water and solutes. Academic press. London.
- Tomlin C. (1994): The pesticide manual. Incorporating the agrochemical hand book, loathed, the royal society of chemistry, crop. Protection publications, pp. 1341.

دراسة معملية وحقلية لتقدير كفاءة الرش بسلفات البوتاسيوم ضد البقعة الخضراء وجاسيد البطاطس بصيبي محصول الطماطم
حسن السيد محمد سالم* و أحمد غازي السيسى**
* معهد بحوث وقاية النباتات. مركز البحوث الزراعية. الدقى. جيزة
** المعمل المركزى للمبيدات. مركز البحوث الزراعية. الدقى. جيزة.

تم إجراء تجربتين لتقدير السمية والنشاط الإبادى لسماذ سلفات البوتاسيوم ضد البقعة الخضراء ونطاطات الأوراق اللذين يصيبا محصول الطماطم وذلك عند تخفيفه بالماء واستخدامه كمحلول رش التجربة الأولى لتقدير السمية ضد الأفنتين تمت برش تركيزات مختلفة من سلفات البوتاسيوم على بادرات الطماطم معدها صناعيا البقعة الخضراء ونطاطات الأوراق بينما كانت التجربة الثانية لتقدير النشاط الإبادى ضد الأفنتين بالإضافة إلى تقدير السمية النباتية لسلفات البوتاسيوم عند رشها بتركيزات ٠,٢٥ ، ٠,٥ و ٠,٧٥% على محصول الطماطم فى الحقل. دلت النتائج المتحصل عليها على أن سلفات البوتاسيوم أظهرت تأثيرا سمييا عاليا ضد البقعة الخضراء ونطاطات الأوراق حيث كان التركيز القاتل لـ ٥٠% من الأفراد هو ٨,٩ ، ٨,٦ جزء فى المليون ضد البقعة الخضراء ونطاطات الأوراق ، على التوالي. بينما دلت التجربة الحقلية على أن تركيز ٠,٥% كان مناسباً لمكافحة الأفنتين على الطماطم دون إحداث أى تأثير سمي نباتى.