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EFFICACY OF DIFFERENT INSECTICIDES AGAINST CUTWORM *AGROTIS IPSILON* (HUFN) ON POTATO CROP AS FOLIAR SPRAY AND SOIL APPLICATION

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ABSTRACT

Potato (*Solanum tuberosum* L), the queen of vegetables is an ideal food crop because of its virtue like wide adaptability, flexibility of production and diverse range of human taste and preference. In India, the major production area of potato (about 74%) is located in three states namely Bihar, U.P. and West Bengal. Potato is attacked by more than 100 Arthropod pests. Cutworms, Aphids, leaf hoppers, white flies, Thrips, Termites, Red ants, *Epilachna* beetles etc. are considered as most serious pests. Out of various insect pests of potato, cutworm. (*Agrotis ipsilon*) is very destructive in Bihar. The efficacy of different insecticides like chlorpyrifos, endosulfan, quinalphos, phorate and carbofuran was studied. Chlorpyrifos 20 EC @ 0.5 L/ha as foliar application was most effective against cutworm when applied twice on plant foliage as well as ridges, first at earthing and second after 21 days of first spray. Foliage damage was recorded only 0.05% while tuber damage was recorded 0.15% by number and 0.10% by weight in this treatment.

KEYWORDS: *Potato, Pest, Cutworm, Agrotis ipsilon, Infestation, Insecticides.*

INTRODUCTION

Potato (*Solanum tuberosum L*) the queen of vegetables is an ideal food crop because of its virtue like wide adaptability, flexibility of production and diverse range of human taste and preference. The changing life style, urbanization and increasing demand for fast food have given a big boost to potato processing both in the developing and developed countries. In India the major production area of potatoes (about 74%) is located in three states namely

Bihar, U.P. and West Bengal. Potato is a rich source of polysaccharide like starch and disaccharide like sucrose. Besides, it also contains crude protein, pure protein, vitamin A, vit. C & important minerals. The iron, phosphorus, calcium, magnesium and zinc in potatoes help in strengthening our bones also. Potato is attacked by more than 100 arthropod pests. Of these, about 80 have been reported in India. Cutworms, Aphids, Leafhoppers, white flies, Thrips, Termites, Red ants, *Epilachna* beetles etc. are considered quite serious. Out of various insect pests of potato, cutworm (*Agrotis ipsilon*) is very destructive in Bihar (Kumar & Tiwary, 2009). The larvae of *Agrotis* damage the potato in its initial stage by cutting the young plants near the ground level and later on by feeding on the tender shoots resulting to degrowth of plant and decreased crop yield. In view of the seriousness of the problem, present investigations were carried out to study the efficacy of different insecticides against cutworm as foliar spray and soil application.

MATERIALS AND METHODS

A field trial was conducted in randomized block design with nine treatments including untreated check in the farmer's field of Muzaffarpur (Bihar) during 2015–2016. Each treatment was replicated four times. The treatments were, T1 – chlorpyrifos 20 EC @ 0.5 L/ha spray once at earthing. T2 – chlorpyrifos – 20 EC @ 0.5 L/ha sprays twice – first at earthing and second after 20 days of first spray, T3 – Endosulfan – 35 EC @ 0.5 L/ha sprays once at earthing, T4 – Endosulfan 35 EC @ 0.5 L/ha sprays twice, first at earthing and second after 20 days of first spray, T5 – Quinalphos 25 EC @ 0.5 L/ha spray once at earthing, T6 – Quinalphos – 25 EC @ 0.5 L / ha sprays twice, first at earthing and second 20 days after first spray, T7 – soil application of phorate 10 GC @ 1.5 kg/ ha at planting T8 – carbofuan 3G @ 1.5 kg/ ha at planting and T9 control (untreated).

The kufri sinduri variety of potato was planted in the first week of November, 2015 in plot size 4.25 × 4 m^2 and spacing 60 x 20 cms. All the agronomical practices were done as per schedule. Weekly observations were recorded on the incidence of *A. ipsilon* on plant foliage. The crop was harvested in the first week of February 2016 when potato attained full maturity. At the time of harvesting damage of tubers due to cutworm both by number and weight basis was recorded.

RESULTS AND DISCUSSION

Findings of experiment are summarized in Table–1 and graphically represented in Figure–1. From the data of the table, it is evident that the percentage of infestation is also influenced by

the size of the tuber. T2 (chloropyrifos 20 EC @ 0.5 L/ha) as foliar application was most effective against cutworm when applied twice on plant foliage as well as ridges first at earthing and second after 20 days of first spray. The Foliar damage was recorded only 0.05% while tuber damage was recorded 0.15% by number and 0.10% by weight. T6 (qunalphos 25 EC @ 0.5 L/ha) was more effective than T4 (Endosulfan 35 EC @ 0.5 L/ha). T7 (Phorate 10G @ 1.5 kg/ha at plainting) and T8 (carbofuran 3G @ 1.5 kg/ha at planting) were recorded less effective than all foliar sprays of experiment. In untreated plots (T9) the foliage damage was recorded 8.75% and tuber damage 18.00% by number and 16.50% by weight. Size of the tuber also influenced infestation. Tuber damage under treatment 9 was recorded 5.50%, 4.50% and 8.00% in larger, medium and small sized tubers respectively by number while 5.00%, 4.00 and 7.50% respectively by weight. It is also evident from the findings that medium sized tubers were less damaged as compared to large and small tubers in almost all treatments. According to Harris et al (1968) only two insecticides Endrin and Dursban of 18 tested as direct contact poisonous against 3rd and 4th instar larvae of *Agrotis ipsilon*. Srivastava and Khan (1962) reported better control of cutworm with soil and foliar application of Endrin, Heptachlor or DDT. Nirula and Kumar (1963) found Aldrin and Heptachlor to be quite effective at the time of planting. According to Mishra et al (1977) persistant chlorinated insecticides such as Aldrin and Heptachlor should not be used against soil pests of potato crop especially being grown for table purposes as these insecticides leave their toxic residues above their tolerance limits, Keeping this problem in view Chandra (1985) and Gulab Ram (1990) advocated the spraying of crop with chlorpyrifos 20 EC @ 0.5 kg/ha on foliage and ridges soon after observing the cutworm. Rajendran and Verma (1989) reported that emulsifiable concentrates of chlorpyrifos (2 litres/ha), quinalphos (1.5 litre/ha), phoxim (0.5 litre / ha) and Endosulfan (1.5 litre / ha) were most effective treatments in minimizing plant and tuber damage by cutwork. According to Kumar (2016), Nimbicide and Limonool were found most effective to check the foliage damage of potato by *Agrotis ipsilon*. Kumar (2016) reported that under the treatment by neem cake, the foliage damage of potato by cutworm was only 0.80%. Kumar and Kumar (2005) reported *Agrotis ipsilon* as a serious pest of potato in Bihar. Mishra and Agrawal (1988) have given a comprehensive list of insect and noninsect pests damaging potato in different parts of India. Simpson (1977) reported that more than 100 Arthropod pests damage potato crop in various parts of the world.

Table 1: Efficacy of Different Insecticides Against Cutworm *Agrotis Ipsilon* (Hufn) on Potato Crop As Foliar Spray And Soil Application.

Treatments	% plants/shoots damage	% Tuber damage							
		By number				By weight			
		Large	Medium	Small	Total	Large	Medium	Small	Total
T1 – chloropyrifos 20 EC @ 0.5 L/ha once at earthing	0.30	0.10	0.20	0.25	0.55	0.05	0.10	0.15	0.30
T2 – chloropyrifos 20 EC @ 0.5 L/ha two sprays 1st at earthing and 2nd 21 days after 1st spray	0.05	0.00	0.05	0.10	0.15	0.00	0.00	0.10	0.10
T3 – Endosulfan 35 EC @ 0.5 L/ha once at earthing	3.50	1.25	1.25	2.50	5.00	1.90	1.25	1.20	4.35
T4 – Endosulfan 35 EC @ 0.5 L/ha 2 sprays 1st at earthing and 2nd 21ys after 1st spray	2.25	0.75	0.50	0.50	1.75	0.45	0.30	0.55	1.30
T5 – Quinalphos 25 EC @ 0.5 L/ha once at earthing	2.50	0.60	0.30	0.30	1.20	0.40	0.35	0.20	0.95
T6 – Quinalphos 25 EC @ 0.5 L/ha 2 sprays 1st at earthing and 2nd 21 days after 1st spray	1.25	0.25	0.10	0.30	0.65	0.15	0.05	0.15	0.35
T7 – Phorate 10G @ 1.5 kg/ha at planting	2.25	1.25	1.25	2.50	5.00	2.25	1.15	1.25	4.65
T8 – carbofuran 3G @ 1.5 kg/ ha at planting	2.00	2.00	1.75	2.50	6.25	1.50	1.25	2.10	4.85
T9 – control (untreated)	8.75	5.50	4.50	8.00	18.00	5.00	4.00	7.50	16.50

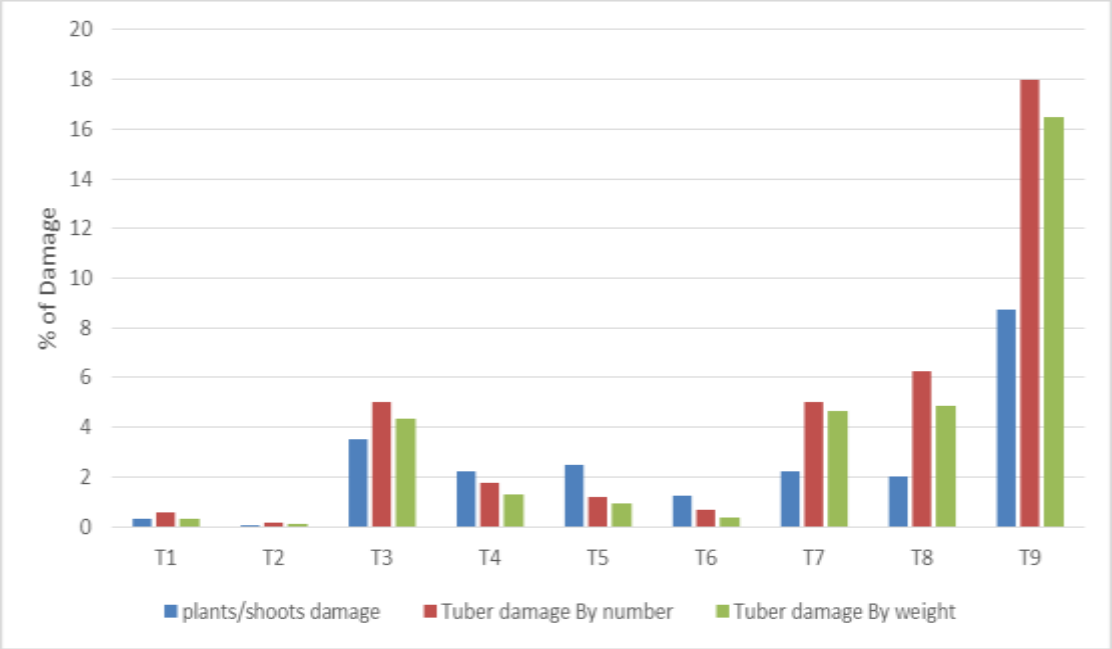

Figure 1: Efficacy of Different Insecticides Against Cutworm *Agrotis Ipsilon* (Hufn) On Potato Crop As Foliar Spray And Soil Application.

T1 – chloropyrifos 20 EC @ 0.5 L/ha once at earthing

T2 – chloropyrifos 20 EC @ 0.5 L/ha two sprays 1st at earthing and 2nd 21 days after 1st spray

T3 – Endosulfan 35 EC @ 0.5 L/ha once at earthing

T4 – Endosulfan 35 EC @ 0.5 L/ha 2 sprays 1st at earthing and 2nd 21ys after 1st spray

T5 – Quinalphos 25 EC @ 0.5 L/ha once at earthing

T6 – Quinalphos 25 EC @ 0.5 L/ha 2 sprays 1st at earthing and 2nd 21 days after 1st spray

T7 – Phorate 10G @ 1.5 kg/ha at planting

T8 – carbofuran 3G @ 1.5 kg/ ha at planting

T9 – control (untreated)

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