FORECASTING THE CHANGES IN THE POPULATION DENSITY OF THE POTATO TUBER MOTH *PHTHORIMAEA OPERCULELLA*(ZELLER) IN RELATION TO PRE AND POST HARVEST PARAMETERS

BY

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B.Sc. Agric. Sc. (Plant Protection), Damascus University, Syria, 2001

M.Sc. Agric. Sc. (Economic Entomology), Ain Shams University, 2005

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ABSTRACT

Ghassan Ali Youssef. Forecasting the Changes in the Population Density of the Potato Tuber Moth *Phthorimaea operculella* (Zeller) in Relation to Pre and Post Harvest Parameters. Unpublished Ph.D. Dissertation, Department of Plant Protection, Faculty of Agriculture, Ain Shams University, Egypt, 2009.

This study was carried out on potato tuber moth *Ph. operculella* at the Insects Laboratory and the Experimental Agricultural Station of the Faculty of Agriculture at Shalakan, Qalyubyia Governorate, Ain Shams University, during a period extending between 2005 and 2008, for establishing IPM control tactics for *Phthorimaea operculella* (Zeller).

The laboratory studies demonstrate the following: Nicola potato variety tubers harbored the least reproductive rates a combined with longest generation time and population doubling time (16.33eggs/female, 29.85 days, and 3.66 days), respectively. Potato tubers of Nicola variety had the lowest concentration of free phenols 19.507 ppm. Leaf moisture content had no effect on the insect preference to potato varieties. The optimum zone of temperature of 25, 27±2 and 30ºC was the most favorable for potato tuber moth population activity and development.

Field experiments revealed that the highest numbers of captured moths were observed during summer months. The insect underwent nine distinct peaks thus representing nine overlapping generations. Nicola was the least susceptible than Atlas, Spunta and Simone varieties for potato tuber moth infestation. The infestation with potato tuber moth increased as rate of fertilization was decreased. Also as the gap period between final irrigation and harvest time was increased and as the period between harvest and handling tubers was increased.

Lunar phases affect significantly the fluctuations in the population density of potato tuber moth. The following two equations were achieved for predicting the expected changes in the population density expressed as number of moths captured weekly using water sex pan pheromone traps for *Ph. operculella* male moths:

$$\hat{Y}_{1M} = \mathrm{Exp}\ (-0.3392 + 1.0015 \times \sqrt{Ta})$$

$$\hat{Y}_{2M} = \mathrm{Exp}\ (-0.7182 + 1.0927 \times \sqrt{Ta})$$

Action Threshold Level was estimated as 7.14 % infestation, causing reliable decrease in yield average of 7.5 %. Damage Threshold Level (DTL) was estimated as 11.90% and the corresponding decrease in yield was 12.56 %. Economic Injury Level (EIL) was estimated as 15.71% and the decrease in yield was equal to 16.58 %. When the following equation C = V I P D, was considered, it yielded losses equal to 19.05% as the highest infestation economic injury allover the potato growing season. Decrease in yield reached 20.1% or more in the fields not treated with pesticides.

Key words:

Potato tuber moth, Life table, Susceptibility of Potato varieties, Agricultural Practices, Metrological factors, Forecasting, Damage Loss, Population dynamics, Monitoring.

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