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- Host preference study of potato tuber moth, Phthorimaea operculella (Zeller) under field & laboratory conditions in Ethiopia.

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The potato tuber moth (PTM), Phthorimaea operculella (Zeller), is an important insect pest of potato in most potato growing countries of the world. In Ethiopia, it was first observed in 1943 (Jannone, 1944); and in recent years its importance in this country has increased because of increase in hectarages of potato.

In an attempt to establish integrated pest management of this pest, progress has been made in the screening of resistant/ tolerant potato varieties/ clones, selecting effective insecticides (for use in the field and storage), and use of cultural practices. In order to make best use of the integrated approach, it has become necessary to identify the host plants of PTM before one grows large acrages of potato in the field. Many species of the family solanaceae cultivated or otherwise are hosts of PTM. Among the cultivated species are:-

Solanum tuberosum L. potato
Nicotiana tabacum L. Tobacco
Lycopersicon esculentum Mill. Tomato
Solanum melongena L. Egg plant.

Among the few non - solanaceous hosts is also Beta vulgaris, the sugar beet (Haines, 1977).

It has also been recorded in America and Europe from the following wild host plants : Solanum carolinense, Solanum nigrum, Solanum paniculatum, Solanum torvum, Solanum verbascofolium, Datura stramonium, Physalodes physalodes, Solanum commersoni, Solanum elaeagnifolium, Solanum elaeagnifolium and Nicotiana sylvestris (Cunningham, 1966).



Therefore the objective of this study was to identify as far as possible, those alternate hosts, cultivated or wild which serve as sources of infestation of the potato in the field.

Materials and methods

An experiment was carried out to study host preference of PTM in the field at Melkasa, (I.A.R) Nazret in 1980/81, growing season. The following host plants were grown:

Datura stramonium
Solanum tuberosum
Lycopersicum esculentum
Nicotiana tabacum
Solanum incanum
Beta vulgaris
Solanum melangena
Capsicum spp.

Each of the species was grown in single alternate rows 6 meters in length replicated four times. Thirty five days after planting, counts of live larvae and mines from 9 plants per row (total of 36 plants) in situ were recorded. Three counts at an interval of 15 days were made throughout the season at natural infestation.

Leaving the host preference study under field condition, an experiment was conducted to study the feeding preference of PTM under laboratory at Awasa, (I.A.R) in 1981/82 and 1982/83 because of irrigation problem. Four barrels with a dimension of 44 cms X 55 cms were used to grow the same host plants that were tested in the field at Melkassa. However, Solanum melangena was not grow in the 1982/83 trial due to lack of planting material. Thirty new emerged moths

irrespective of their sex were released into the barrels to oviposit on the host plants of their choices. Barrels were caged by clothe meshes to avoid escape of moths. One week after infestation, counts of live larvae and number of mines were recorded from each plant for three times in the season.

Results and Discussion

Feeding preference of PM on the different host plants at field condition (Table 1) showed that the leaves of Solanum tuberosum and Nicotiana tabacum were the most preferred among the cultivated plants and the leaves of Datura stramonium among the wild ones. This has also been observed by Meisner et.al (1974). Beta vulgaris and Solanum incanum were the least preferred hosts by the larvae of P. operculella. The mean number of mines in these plants were significantly fewer than those other host plants. Lycopersicum esculentum and Solanum melangana were intermediate between the least and most preferred host plants. The most preferred ones were with many larvae and mines as shown in Table 1.

Under laboratory condition as shown in Table 1, Solanum tuberosum followed by Nicotiana tabacum was the most preferred among the cultivated species and Datura stramonium among the wild host plants. As it is indicated in Table 2 Nicotiana tabacum from the cultivated species followed by Solanum tuberosum and Datura stramonium from the wild species were highly preferred by the moth. This observation was in agreement with the above result of the field study. Beta vulgaris and Solanum incanum were the least preferred hosts since they had fewer mines. Comparison among the mean number of mines showed significant differences among the mean number of larvae between host plants except Solanum tuberosum which showed statistically higher mean number of mines and larvae.

This indicates that one larva could cause more than one mine if it infests a favourable host plant. Beta vulgaris, Capiscum spp. Solanum incunum and Lycopersicum esculentum were the least preferred while Solanum melongana was intermediate between the most and least preferred host plants as far as mean number of mines were concerned since mines caused are indications of preference by the larva. Therefore, all tubers of potato at harvest must be removed from the soil and should be destroyed quickly, preferably by burning all the debris. The soil should be cultivated well and any overlooked tubers should be destroyed since volunteer plants form foci of infestation. Any wild solanaceae such as Datura stramonium which incidentally is one of the commonest weeds should be destroyed since it acts as a reservoir for population of the moth. Rotation of crops, so that susceptible plants (potato, tobacco, etc.) should never be planted on the same ground in two successive years.

Table 1.

Feeding preferences of PTM on foliages of different host plants under field condition at Melkasa 1981 and laboratory condition at Awasa 1982.

Host Plants	1981/a		1982/b	
	Mean number of		Mean number of	
	Mines	Larvae	Mines	Larvae
<u>Beta vulgaris</u> L.	5.7 a**	1.5 a	8.75 a	2.50 a
<u>Solanum incanum</u>	7.2 a	1.7 a	10.50 a	3.50 ab
<u>Capiscum</u> spp.	13.7 b	5.0 a	16.75 ab	4.00 ab
<u>Lycopersicum exculentum</u> Mill	21.0 c	10.0 bc	23.50 bc	5.75 ab
<u>Solanum melongana</u> L.	24.5 c	9.0 b	27.25 cd	9.75 bc
<u>Nicotiana tabacum</u> L.	32.7 d	13.0 cd	34.50 d	12.50 c
<u>Datura stromonium</u>	47.7 e	15.5 d	36.50 de	14.25 c
<u>Solanum tuberosum</u> L.	71.7 f	35.2 e	45.75 e	18.25 c
Mean	28.27	11.36	25.43	8.81
S.E.	2.00	1.20	3.25	2.30

a/ 1981 trial was conducted under field condition. 9 plants taken from each of four replicates in each host plant.

b/ 1982 trial was conducted under laboratory condition; 4 plants taken from each of four replicates.

* Means followed by the same letters are not statistically different at 5% level (Duncan's New Multiple Range Test).

Table 2. Feeding preference of PTM on foliages of different host plants under laboratory condition. 1983

Host Plants a/	Mean number of	
	Minors	Larvae
<u>Capsicum</u> spp.	* 0 a	0 a
<u>Lycopersicum esculentum</u>	0 a	0 a
<u>Beta vulgaris</u>	0.5 aa	0 a
<u>Solanum incanum</u>	1.25 s	2.0 a
<u>Solanum tuberosum</u>	5.00 a	7.75ab
<u>Nicotiana tabacum</u>	10.75 b	15.0 b
<u>Datura stramonium</u>	10.75 b	18.0 b
Mean	4.03	6.10
S.E.	1.40	3.14
L.S.D at 1% level	5.60	12.56

a/ 2 plants taken from each of four replicates in each host plant

* Means followed by the same letters are not statistically different at 5% level (Duncan's New Multiple Range Test).

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