Biospectra : Vol. 10(2), Sept., 2015, pp. 25-28
An International Biannual Refereed Journal of Life Sciences

Animal Science

ISSN : 0973-7057

Studies on the duration of different stages of the onion thrips, *Thrips tabaci* L at Muzaffarpur, Bihar, India

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Received : 15th April, 2015; Revised : 17th June, 2015

Abstract : *Allium* vegetables have been cultivated for centuries for not only their characteristic pungent flavours but also for their medicinal properties. The possible health benefits of onions include lowering the risk of several types of Cancer, improving mood and maintaining the health of skin and hair. India ranks second in onion production (next to China). India produces about 12% of World's production of onion. In Bihar, onion is cultivated in about 16,000 hac. Bihar is fifth onion producing state of India. Bihar has no impressive production performance of onion, but, the agro–climatic conditions and the soil of Bihar is too much suitable and ideal for onion. Out of various factors for low onion production in Bihar, insect infestation is very important. Onion thrips, *Thrips tabaci* is most important insect pest of onion. Present investigation was carried out to study the duration of different stages of the onion thrips in Muzaffarpur (Bihar). Life cycle duration was minimum (12.5 days) in April while it was maximum (26.5 days) in January.

Keywords : Onion, Onion thrips, *Thrips tabaci*, Life cycle, Infestation

INTRODUCTION

Onion (*Allium cepa* L) belongs to Allium family of vegetables and herbs which also includes garlic, chives, scallions and leeks. Allum vegetables have been cultivated for centuries for not only their characteristic pungent flavours but also for their medicinal properties. The possible health benefits of consuming onions include lowering the risk of several types of Cancer, improving mood and maintaining the health of skin and hair. Onions are low in calories but high in useful nutrients like vitamins, minerals and antioxidants. One cup of chopped onion contains about 60 calories, 3 grams of fibre, 15 grams of carbohydrate, 2 grams of protein and 10% or more of the daily value for vitamin C, Vit B6 and manganese. It also contains small amount of calcium, iron, magnesium, potassium, phosphorus and the antioxidants quercetin and sulphur. It has almost no fat and cholesterol. It is estimated that around the world over 3,642,000 hac. of onions are grown annually. India ranks second in onion production (next to China). India produces about 12% of world's production of onion. In Bihar, however, the area covered by onion is about 16,000 hac. In India, Maharashtra has greatest potentiality in onion production from domestic and world market point of view. Bihar is fifth onion producing state of India (Next to Maharashtra, Karnataka, M.P. and Gujarat). Bihar has no impressive production performance of onion, but, the agro–climatic conditions & the soil of Bihar is so much suitable and ideal for onion that its production may be enhanced and it may be exported to Mauritius, Sri Lanka and Nepal (Prasad, 2002)[1]. There are many factors for low onion production in Bihar. Insect pest infestation is one of the main factors. Onion is infested by several insect pests like onion thrips, *Thrips tabaci* L; onion fly, *Delia antique* M; Cutworm, *Agrotis ipsilon* H etc. Out of these insect pests, onion thrips is most destructive. Onion thrips is worldwide in distribution and attacks other Allium crops also (Rahman & Batra, 1945;[2] Vevai Talgeri, 1948[3]; and Thirumala Rao et al, 1950)[4]. According to More, 1977[5] and Gupta et al, 1984[6], onion thrips cause up to 90% foliage injury. Kisha, 1977[7] reported 55 to 57% yield loss in onion due to *Thrips tabaci* L. Both

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adults and nymphs are destructive. Thrips are most damaging when they feed during the early stage of plant development. Scarring of leaves is a serious problem on green onions. Onion thrips feed under the leaf folds and in the protected inner leaves near the bulb. When population is very high, thrips may be found feeding an exposed leaf surfaces. Present investigation was carried out to study the duration of different stages of the onion thrips at Muzaffarpur (Bihar) in laboratory conditions during 2012–13.

MATERIALS AND METHODS

The stock culture of onion thrips was maintained in laboratory by collecting immature stages of thrips from the infested onion fields and confining them within petridishes (4" in diameter) containing moist sand. The moist sand layer in turn was covered with blotting paper and then fresh onion leaves provided there. The larvae which attained the prepupal stage were isolated and kept in another petridish for studying the prepupal period. The petridishes were provided with a layer of moist sand at the bottom only to keep the materials free from desiccation. After attaining the pupal stage, they were separated carefully with the help of fine camel hair brush and were placed to another petridish for emergence of the adults. The adults, when emerged were transferred into the glass vial (10" in diameter and 4" deep). The glass vial was provided soil at its bottom and two onion plants were planted at equal distance inside it. A square cork sheet was used to cover the glass vial having two circular holes to pass the two planted onion plants, one plant being enclosed at each hole. Now, two glass vials (2" diameter and 6" height) having both ends open, were inserted inside the holes of the cork sheet enclosing the plants. The top of the glass vial was closed with cellophane sheet with the help of rubberband while the lower end of the vial was firmly fixed on the edge of the cork sheet holes by means of cotton band. Now, the adult thrips were introduced inside the vial by means of a wet camel hair brush. As soon as oviposision was observed, the number of eggs laid by female thrips counted and recorded on hatching, the larvae were isolated and reared on onion leaves inside the petridishes as described earlier.

RESULTS AND DISCUSSION

Incubation period and the percentage of hatchability of eggs :

The data of the incubation period of eggs and the percentage of hatchability of the larvae was summarised in Table – 1. From the data of the table, it is evident that the duration of incubation period varied from month to month. The longest incubation period (10 days) was observed during January when the average temperature and relative humidity were 15^0C and 69.0 percent respectively, while the shortest period (5.5 days) was found during April when the average temperature and relative humidity were 29^0C and 50 percent respectively. High temperature coupled with low relative humidity shortened the incubation period while low temperature coupled with high relative humidity prolonged incubation period. The percentage of hatchability seems to be influenced by high percentage of relative humidity with moderate temperature. It was highest (90%) during November when the temperature was 17.6^0C and relative humidity was 68% where as the hatchability during April was only 60% when the temperature was 29^0C and relative humidity was 50%.

Table – 1 : Duration of incubation period of onion thrips and the percentage of hatchability of eggs on onion plants

Months	Average Temp in 0^0C	Average R. Humidity in %	Incubation Period			Hatchability		
			Maximum	Minimum	Average	No. of eggs under observation	No. of larvae hatched	% hatchability
Nov. 2012	17.60	68.0	11	7	9.0	40	36	90.0
Dec. 2012	17.30	68.7	10	7	8.5	40	30	75.0
Jan. 2013	15.00	69.0	12	8	10.0	40	30	75.0
Feb. 2013	22.60	66.0	9	5	7.0	40	28	70.0
March 2013	25.50	58.0	7	5	6.0	40	28	70.0
April 2013	29.00	50.0	6	5	5.5	40	24	60.0

Larval period :

The data of the larval period is summarised in Table–2. From the data of the Table, it is evident that the duration of larval period varied between 4 to 8.5 days during November to April. The longest larval period (8.5 days) was observed during January while the shortest (4.0 days) during April. The average temperature during January and April was 15^{0}C and 29^{0}C respectively whereas the relative humidity of those period was 69% and 50% respectively. An increase in temperature and decrease in relative humidity seemed to shorten the duration of larval period. The survival percentage of larvae which attained the prepupol stage was highest (80%) during April and lowest (60%) during January.

Table - 2 : Duration of Larval period of onion thrips on onion plants

Months	Average Temp in 0^{0}C	Average R. Humidity in %	Duration in Days			No. of larvae under observation	No. of larvae attended prepupal stage	% of survival
			Maximum	Minimum	Average			
Nov. 2012	17.60	68.0	9	6	7.5	40	28	70.0
Dec. 2012	17.30	68.7	9	7	8.0	40	26	65.0
Jan. 2013	15.00	69.0	9	8	8.5	40	24	60.0
Feb. 2013	22.60	66.0	7	6	6.5	40	25	62.5
March 2013	25.50	58.0	6	5	5.5	40	30	75.0
April 2013	29.00	50.0	5	3	4.0	40	32	80.0

Pre–pupal period :

The data of the findings is presented in Table–3. It is evident from the table, that the duration of prepupal stage enhanced during cooler months. It was longest (3.0 days) during January and shortest (1.5 days) during April. The highest survival percentage (70%) was observed during April and lowest (55%) during January.

Table - 3 : Duration of Pre-Pupal period of onion thrips

Months	Average Temp in 0^{0}C	Average R. Humidity in %	Duration in Days			No. of Prepupae under observation	No. of Pupae formed	% Survival
			Maximum	Minimum	Average			
Nov. 2012	17.60	68.0	3	2	2.5	20	12	60
Dec. 2012	17.30	68.7	3	2	2.5	20	12	60
Jan. 2013	15.00	69.0	4	2	3.0	20	11	55
Feb. 2013	22.60	66.0	3	1	2.0	20	12	60
March 2013	25.50	58.0	2	1	1.5	20	13	65
April 2013	29.00	50.0	2	1	1.5	20	14	70

Pupal stage :

Findings summarised in Table–4. From careful study of the data of the table, it is clear that the longest duration of pupal period (5 days) was observed during January while the shortest period (1.5 days) in April. The average temperature and relative humidity during January were 15^{0}C and 69% respectively while during April, the temperature and relative humidity were 29^{0}C and 50% respectively. The survival percentage of the pupal was highest (80%) during April while lowest (60%) during January.

Table - 4 : Duration of Pupal period of onion thrips

Months	Average Temp in 0^0C	Average R. Humidity in %	Duration in Days			No. of Pupae under observation	No. of Adults emerged	% Survival
			Maximum	Minimum	Average			
Nov. 2012	17.60	68.0	4	3	3.5	15	10	66.0
Dec. 2012	17.30	68.7	5	3	4.0	15	10	66.0
Jan. 2013	15.00	69.0	5	4	5.0	15	9	60.0
Feb. 2013	22.60	66.0	5	3	4.0	15	11	66.0
March 2013	25.50	58.0	3	2	2.5	15	11	73.3
April 2013	29.00	50.0	2	1	1.5	15	12	80.0

Total Life Cycle Duration :

Findings are summarised in Table–5. From the data of the table, it is evident that the life cycle duration of onion thrips on onion plants (in laboratory) varied from month to month. The longest duration (26.5 days) was observed during January and shortest duration (12.5 days) was during April. The average temperature and relative humidity during January were 15^0C and 69% respectively while during April were 29^0C and 50% respectively. High temperature coupled with low humidity seemed to accelerate the growth and reduce life cycle duration while low temperature coupled with high humidity retarded growth and increased life cycle duration. Rahman & Batra (1945)[2] and Ramchandran (1950)[8] reported that the duration of life cycle of onion thrips varied from 15.0 to 25.0 days. According the Lall & Singh (1968)[9] the life cycle of onion thrips in the laboratory required 21 days during December – January and 14 days in April.

Table - 5 : Duration of immature stages and total life cycle of Onion thrips on onion plants under laboratory

Months	Average Temp in 0^0C	Average R. Humidity in %	Average duration in Days				
			Incubation	Larval	Pre–pupal	Pupal	Total Life Cycle
Nov. 2012	17.60	68.0	9.0	7.5	2.5	3.5	22.5
Dec. 2012	17.30	68.7	8.5	8.0	2.5	4.0	23.0
Jan. 2013	15.00	69.0	10.0	8.5	3.0	5.0	26.5
Feb. 2013	22.60	66.0	7.0	6.5	2.0	4.0	19.5
March 2013	25.50	58.0	6.0	5.5	1.5	2.5	15.5
April 2013	29.00	50.0	5.5	4.0	1.5	1.5	12.5

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