



ISSN: 0975-833X

RESEARCH ARTICLE

Effect of Texture/Morphology of Host Plants on the Biology of *Brevicoryne brassicae* (L.) (Homoptera: Aphididae)

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ARTICLE INFO

Article History:

Received 88th November, 2012
Received in revised form
30th December, 2012
Accepted 09th January, 2013
Published online 14th February, 2013

Key words:

B.brassicae,
biological parameters,
pest, vector,
diseases cruciferous crops.

ABSTRACT

The aphid *B.brassicae* is a key pest of various cruciferous crops like cabbage, cauliflower, kale and other such *Brassica* species. The objective of the present work was to evaluate the effect of texture/morphology of two cruciferous crops viz. cauliflower and turnip on the biology of *B.brassicae* under natural conditions of temperature and humidity. The mean developmental period, reproductive period, adult longevity and total longevity so recorded were subjected to t-test. The developmental period on turnip was recorded as (9.91 days) and on cauliflower as (8.75 days). The reproductive period on cauliflower and turnip was recorded 18.8 and 4.29 days respectively. Similarly the adult longevity on cauliflower was recorded as (20.98 days) and on turnip as (6.17 days). The total longevity on cauliflower and turnip was recorded as 28.92 and 14.88 days respectively. The results revealed significant differences in the biological parameters of *B.brassicae* on cauliflower and turnip. The differences in the biological parameters in cauliflower and turnip can be attributed to differences in nutritional quality, physiology and morphological structure of the host plants.

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INTRODUCTION

Aphids, commonly known as “Plant lice” or “Green bugs” inflict damage to plants in a number of ways, including malformation of various plant parts, gall formation, destruction of foliage, stunted growth, leaf curling, obstruction in assimilation, wilting and sometimes collapse of a plant. Among aphids, the cabbage aphid, *Brevicoryne brassicae* (L.) is one of the most important pests of cruciferous crops like cabbage, cauliflower, knol-khol and kale. This aphid is considered one of the most damaging and consistently present pest on cabbage crops (Theunissen,1989). They are also known to be the vectors of various plant viruses (Brunt *et al.*, 1996; Buchen-Usmond 2002; Kennedy *et al.*,1962. *B.brassicae* has four instars in the life cycle. (Hafez, 1961) has shown that the number of generations per year to be 6 and 11 in Netherland. Several studies have shown that the morphology and temperature dependent development of aphids including *B.brassicae* may be strongly influenced by the geographical origin of the aphid (Campbell *et al.*, 1974); Footitt and Mackauer, 1990; Mokhtar *et al.*,1993),while other authors emphasize the effect of the host plants on the morphological variations and aphid development (Wool and Hales, 1996; 1997; Kersting *et al.*,1998) The aim of the present study was to evaluate the effect of two host plants of *B.brassicae* (cauliflower and turnip) with different texture of leaves (smooth and hairy) on the biological parameters__ developmental period, reproductive period, adult longevity and total longevity in its life cycle under natural conditions.

MATERIALS AND METHODS

Cultivation of plants

Seeds of cauliflower and Turnip were sown in Nursery beds in the month of Feb-March 2010. This was done to ensure the availability of stock all round the year for experimentation. When the plants had 5-6 leaves, they were transplanted into pots filled a week earlier with

a mixture of loam soil and rotten manure in the ratio of 1:1. The plants were watered once a week.

Rearing of Aphids

The cabbage aphid *B.brassicae* (L.) used in the experiment was obtained from an agricultural field. In order to rear the aphids, 20 apterous viviparous females were introduced on a potted cauliflower and Turnip plant. The plants were covered with a fine net in order to prevent the attack of cabbage aphids by parasites and predators. The potted plants were kept under natural conditions of temperature and humidity until each experiment was concluded.

Experiment

To observe the effect of different texture of leaves on the biological parameters of cabbage aphid, five plants of cauliflower and turnip plants were transplanted into the pots with soil in the month of May 2010. The maximum and minimum mean temperatures recorded during this month were 22.7°C and 11.1°C respectively. The maximum and minimum mean relative humidity recorded during this month was 78 % and 61 %. Four leaves on each plant were covered with leaf cages. Five apterous viviparous females from the reared stock were introduced on each leaf of the host plant. When the first instars were born, the adults were removed. The plants were covered with a fine net. The different biological parameters of cabbage aphid were noted down. The developmental period, reproductive period, adult longevity and total longevity of the cabbage aphid as recorded during the experiment on cauliflower were compared with the biological parameters of *B. brassicae* as recorded on Turnip

Statistical Analysis

The data generated was subjected to t-test for drawing inferences.

RESULTS

The data on the biology of *B.brassicae* on cauliflower and turnip was recorded in the month of May 2010. Perusal of the data in Table-1

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shows that the developmental period of *B. brassicae* on cauliflower and turnip was (8.75±0.06) and (9.91±0.06) days respectively. The reproductive period on cauliflower was recorded as (18.8 ±0.02) days and on Turnip as (4.29 ±0.05) days. Likewise the adult longevity on cauliflower and turnip was recorded as (20.98 ±0.19) and (6.17 ±0.07) days respectively. The total longevity of *B. brassicae* on cauliflower and cabbage was recorded as (28.92± 0.19) and (14.88±0.10) days respectively.

Table 1. Mean biological durations of cabbage aphid (*Brevicoryne brassicae*) on Cauliflower and Turnip in the month of May 2010 on potted plants

Development Stages	Cauliflower	Turnip
(Nymphs)		
Ist instar	1.88±0.02	1.79±0.01
2 nd instar	1.75±0.02	1.69±0.01
3 rd instar	2.03±0.03	2.43±0.02
4 th instar	2.26±0.04	2.79±0.01
Nymphal period	7.94±0.06	8.71±0.04
Adults		
Pre-reproductive period	0.81±0.02	1.20±0.02
Reproductive period	18.8±0.02	4.29±0.05
Post-reproductive period	1.37±0.02	0.67±0.02
Developmental Period	8.75±0.06	9.91±0.06
Adult Longevity	20.98±0.19	6.17±0.07
Total Longevity	28.92±0.19	14.88±0.10

DISCUSSION

The developmental period, reproductive period, adult longevity and total longevity of *B.brassicae* on cauliflower and turnip as recorded in the above experiment were subjected t-test. The results of the t-test reveal that the developmental period, reproductive period, adult longevity and total longevity of *B.brassicae* on cauliflower and turnip are significantly different (The calculated value of ‘t’ was found to be greater than the table ‘t’ value at 0.05 level (p=0.000, df=38) Fig.1,2,3 and 4). The slight increase in the developmental period in turnip (9.91 days) than the cauliflower (8.75 days) is presumably due to less sinigrin accumulation in young turnip leaves in early growth stages as compared to cauliflower (in which outer mature leaves were chosen to study the biology of the pest). The less sinigrin concentration in leaves decreases the growth rate of *B.brassicae* on turnip and thus results in longer nymphal duration. Similar findings have been reported by (Van Emden,1972) according to whom the growth rate of *B.brassicae* is enhanced by increasing the concentration of sinigrin in the leaves. The differences in the biological parameters can be attributed to the differences in the nutritional quality, physiology, morphological and chemical structure of cauliflower and turnip leaves. Robert (1987) stated that the chemical structure, quality of nutriment and colour of leaf affect developmental time, life span, survival rate and fecundity of aphids. Ulusoy and Bayhan (2006) reported developmental time on cabbage and cauliflower to be 10.4 and 8.9 days respectively and adult

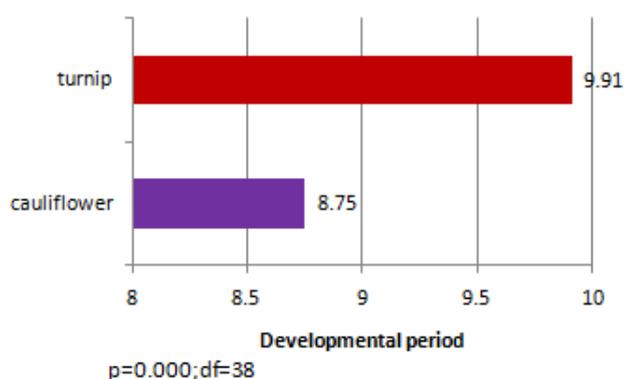


Fig. 1. Nymphal duration of *Brevicoryne brassicae* on cauliflower and Turnip.

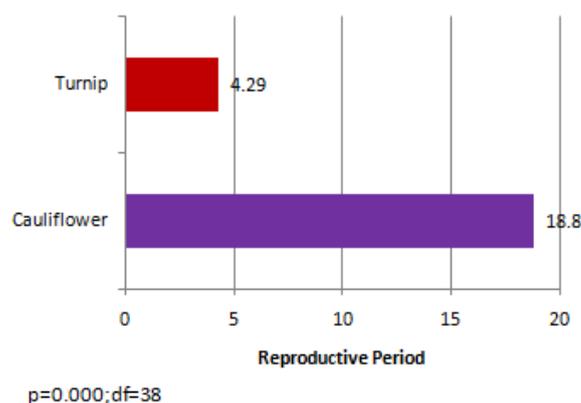


Fig. 2. Reproductive period of *Brevicoryne brassicae* on cauliflower and Turnip.

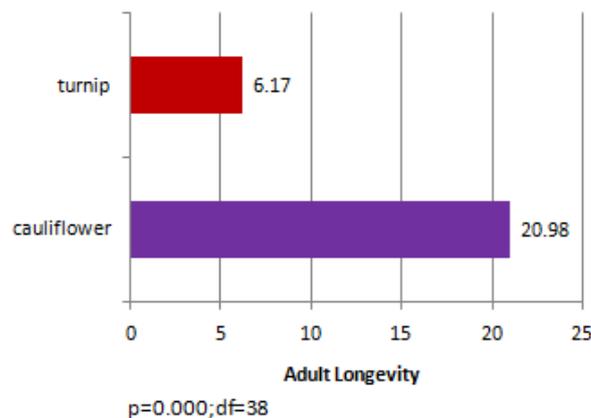


Fig. 3. Adult longevity of *Brevicoryne brassicae* on cauliflower and Turnip

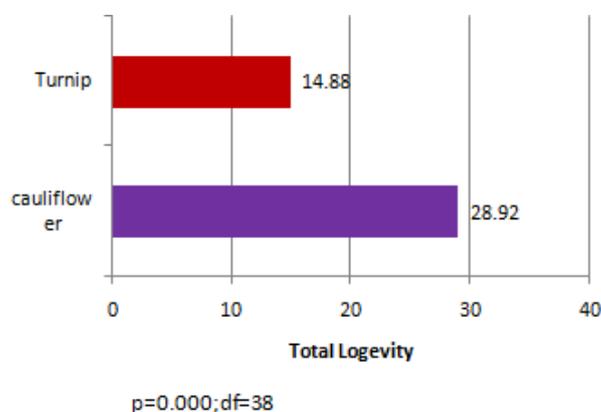


Fig. 4. Total longevity of *Brevicoryne brassicae* on cauliflower and Turnip

longevity to be 11.1 and 21.8 days on cabbage and cauliflower at 20.1°C and 60.5 % relative humidity Kennedy and Abou-Ghadir (1979) reported that the different developmental times on different plants from first instar to adult turnip aphids, can be attributed to differences in the levels of sensitivity and resistance of the host plants.

Acknowledgements

The authors are highly grateful to the Head, Post- graduate Department of Zoology, University of Kashmir for providing Laboratory facilities. They are also thankful to Dr. Parvez Ahmad, Assistant Professor, Department of Statistics, University of Kashmir for manifold help and encouragement.

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