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HOST PLANT PREFERENCE OF *Pieris rapae* L. ON VARIOUS PLANTS UNDER LABORATORY CONDITIONS

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ABSTRACT: The suitability of three host plants, cabbage, turnip, and radish, for the evolution and propagation of *Pieris rapae* was estimated. Host plants were reared in larval instars after being detached. The evolution period was shorter when P. rapae was fed cabbage leaves (28.54 ± 1.29 days) which the *P. rapae*; was reared on cabbage leaves and longer when fed radish leaves (31.80 ± 1.40 days). *Pieris rapae* biology revealed that eggs hatched in 3-5 days, with a mean of 3.29±0.24, 4.80 ±0.18 and 2.86± 0.24 days on cabbage, Turnip and Radish, respectively. It had five larval instars, and the total larval development period was significantly shorter (17.68 ± 1.67 days) when fed cabbage leaves and longer (23.57 ± 1.73 days) when fed turnip leaves. When *P. rapae* was reared as a radish, adult life span was significantly increased, as was food consumption. *P. rapae* had the highest fecundity when fed cabbage (201.0 ± 9.97 eggs/female) and the lowest fecundity when fed radish (183.00 ±7.45 eggs/female).

Key words: Host plant, *P. rapae*, biology.

INTRODUCTION

Cabbage, cauliflower, mustard and rape plants differ is their susceptibility to insect pests such as imported *Pieris rapae* and sucking insect pest **(Embaby and Lotfy, 2015)**. Under field conditions, these cruciferous crops are vulnerable to attack in Egypt **(El-Sufty *et al.*, 1983; El-Shamy, 1990).** *Pieris rapae* L. (Lepiddoptera: Pieridae), also known as *Artogeia rapae* **(Ibrahim *et al.*, 1996)**, is a serious insect pest that infests cruciferous vegetables **(Del *et al.*, 2005)** and causes significant damage, particularly to cabbage and cauliflower **(Jankowska, 2005).** This caterpillar's feeding injury may reduce production to zero **(Abdel-Razek *et al.*, 2006).** Some researchers investigated the impact of various host plants on *Pieris rapae*.Numerous insect pests attack cabbage and cauliflower in the field **(Ali *et al.*, 1984; Ibrahim *et al.*, 1996)**. *Pieris rapae* is a major insect on cabbage and cauliflower, and the first week of November saw the highest average larvae count **(Younas *et al.*, 2004; Van Driesche, 2008; Capinera, 2014).**

The purpose of this study was to investigate the biology and host plant preferences of Pieris rapae on cabbage, turnip, and radish.

MATERIALS AND METHODS

The trail was executed at the Plant Protection Department's Sharkia branch from September 2022 to January 2023. On cabbage (*Brassica oleracea* var. *capitata* L.), Turnip (Brassica campestris), and Radish (*Raphanus raphanistrum* L). Three field crops, cabbage, Turnip and Radish were examined to detect the host plant preference of *P. rapae* (immature stage). About half feddan was divided three plots.

Effect of Host Plants on the Biology White Butter Fly *Pieris rapae*

Adults of *Pieris rapae* (L.) were taken from cabbage plants, moved outside the lab, and divided into three groups. Either group was kept as a separate stock and raised on each *Brassica oleracea* var. *capitata* L. cabbage plant, *Brassica rapae rapifera* turnip plant, and

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Raphanus raphanistrum L. radish plant in tiny cages in the lab. Three groups' daily laid eggs were delicately moved to a Petri dishes. Thirty freshly hatched first instar larvae of each *Pieris rapae* were placed singly into glass jars (20×10 cm) and separated into three groups, each of which included 10 larvae, which were used as replicas. The final three groups were raised on cabbage, turnip, and, separately, radish leaves. Larvae go through five developmental phases, or instars. The larvae of butterflies were fed daily fresh leaves of (cabbage, radish, and turnip). For each *P. rapae*, the length of the egg, larval, and pupal stages were estimated. Ten cages were taken for each species' oviposition trials (21±2℃, 60±2% RH). To maintained that the females were mated, two females and two males were released in either cage. Ten females were choices for Ovipostion of each host plant. *P. rapae* females supply with artificial diet in each cage. The plants were set up for egg hold or egg payment, and the quantity of eggs or clutches was noted.

Statistical Analysis

Data on the longevity, fertility, and average duration per larval stage of *P. rapae* when raised on various plants using Dancan, s Multiple Rang Test **(Cohrot Software 2004)**.

RESULTS AND DISCUSSION

Incubation Period

Data in Table 1 showed that the eggs of *Pieris rapae* hatched in 3.29 ± 0.24, 4.80 ± 0.18 and 2.86±0.24 days, when the larvae were raised on cabbage, radish, and turnip leaves, respectively. The preferred egg-depositing posture is influenced by a variety of factors as well. the idea that females pick to ovulate on plants that they previously used as nourishment for their larvae (**Szentesi, Jermy, 1990**). However, **Jõgar *et al.* (2008**) noted that *P. rapae* butterflies select the cultivar of cabbage for oviposition. According to its fittings, *P. rapae* status host plants. For instance, the first to be chosen are the varieties and forms of cabbage, followed by wallflower and worm-seed mustard (Erysimum) (Cheiranthus). *P. rapae* females have sensory organs on their tarsi (**Van Loon *et al.*, 1992; Städler *et al.*, 1995**) According to certain authors, *P. rapae* is mentioned throughout the entire nation wherever cruciferous weeds and vegetables like cabbage, cauliflower, and canola are grown **El- Sufty *et al.* (1983).**

Larvae period

P. rapae had five instars of larva. The average time between the first, second, third, fourth, and fifth larval instars were determined. When the larvae were raised on each cabbage or turnip (2.85± 0.13and 3.14± 0.51days). *Pieris rapae* 1st instar was considerably impacted. When larvae were raised on radish (4.86 ± 0.26 days) their second instar larvae production was much higher than when they were fed cabbage and turnips (3.29 ± 0.20 and 3.24 ± 0.22 days). When the third and fourth instar larvae were fed on the three host plants (3.42 ± 0.20, 4.00 ± 0.14, 4.14 ± 0.40 and3.86± 0.23, 3.81 ± 0.31, 4.00 ± 0.30 days), growth was not statistically different. When the larvae were raised on the same host plants, there was a substantial influence on the fifth larval instar (4.26 ± 0.30, 3.76 ± 0.26 and 3.14 ±0.40 days). *Pieris rapae* larvae spent 17.68± 1.67, 19.57±1.45 and 23.57 ± days respectively, feeding on cabbage, radish, and turnip leaves (Table 1). The fitness of caterpillars in their first instar is also expected to be significantly impacted by very small differences in food quality, but these variations may have a less substantial impact on caterpillars in later instars. According to **Rai *et al.* (1985)**, the larval period ranged from 15 to 31 days when fed on cabbage and cauliflower, compared to a range of 16 to 18 days when raised on cabbage. Additionally, **Devjani (1999)** observed that when raised on cauliflower in Manipur, the larval period was18.27 ± 0.73 days and the overall life span from egg to adult was 44.75 ±1.71 days. These findings are in line with those made by **Abo-Zaid (2006)**, who claimed that P. rapae larvae spent the smallest amount of time in their larval stage when they were fed on cabbage, then on cauliflower, turnips, radish, and, ultimately, canola..

Pupa period

When the adults were raised on either cabbage, radish, or turnip leaves, the pupal duration of *Pieris rapae*, (7.57 ± 0.53, 7.43± 1.33 and 8.0± 069days) did not significantly differ.

Table 1. Life cycle of *Pieris rapae* on Cabbage , Radish and Turnip crops under laboratory condition

Treatment	Incubation period	Larval duration (in days)					Total	Pupal stages	Mean egg-adult	Adult longevity	
		1st	2nd	3rd	4th	5th	Larva stages			Female	Male
Cabbage	3.29±0.24b	2.85±0.13b	3.29±0.20b	3.42±0.20	3.86±0.21	4.26±0.30a	17.68±1. 67 a	7.57±0.53	28.54±1.29a	9.16±0.48 b	7.00 ±0.46b
Radish	4.80±0.18 a	3.14±0.51b	4.86±0.26a	4.00±0.14	3.81±0.31	3.76ab±0.26	19.57±1.45 ab	7.43±1.33	31.80±1.40b	13.14±0.36a	9.17 ±.041a
Turnip	2.86±0.24b	6.14±0.24a	3.24±0.22b	4.14±0.40	4.00±0.30	3.14±0.40b	23.57±1.73b	8.00±0.69	31.57±1.86ab	14.86± .47a	10.14± .55a
F test	0.001**	0.000**	0.000***	N.S.	N.S.	0.0649*	0.0751*	N.S.	0.0192*	0000***	0.0011**
LSD0.05	0.74	1.01	0.63	0.77	0.91	0.95	4.63	2.79	3.11	1.99	1.52

This was consistent with the findings of **Ghosh (1914)**, who noted the life cycles of several lepidopteran insects in particular in India. The total larval period, in his estimation, lasted 15–17 days.

The Total Development Period

When the larvae were reared on cabbage leaves, the overall development time was noticeably shortened, and when they were raised on radish leaves, it had a considerable influence. P. rapae's life cycle was, respectively, 28.54± 1.29 , 31.80 ± 1.40 and 31.57 ± days when *when* it consumed turnip, radish, and cabbage Table 1. These findings are in line with **Singh's (2018)** observation that *P. brassicae* biology demonstrated that the pest went through four stages, including egg, larva, pupa, and adult.In 4.40±0.37 days the eggs hatched. It had five instars of larva. The first, second, third, fourth, and fifth larval instars had respective mean durations of 3.20±0.20 days, 3.50 ± 0.17 days, 4.00 ± 0.30 days, 4.40 ± 0.16 days and 4.00±0.26days. From egg through adult emergence, the mean pupal duration and total development period were12.20±0.25 days and 35.90±1.07 days,, respectively.

Pourarian and Rasipour (2016), who demonstrated that the biology of the *Pieris rapae* egg phase lasted 5-7 days, lend support to this. The larval stage lasted for 20–30 days, and the pupal stage for 6–9 days. *Pieris rapae* had an adult life span 7 to 10 days for male and female.

Longevity

When fed turnips (10.14±0.55 days) or radish (9.17 ± 0.41 days), males lived significantly longer than when fed cabbage (7.00 ± 0.46 days) (Fig. 1).

When larval females were reared on cabbage leaves (201.00 ± 5.40eggs/ female), as opposed to those who were reared on turnips (195.00 ± 7.16 eggs/female), there was a highly significant difference in the number of eggs deposited per female. When the adults were raised on radish, however, a significantly smaller quantity of eggs (183.00 ± 9.01 eggs/ female) were laid. In other hand, feeding cabbage leaves to females increased their fertility (Fig. 2).

P. rapae's oviposition process is designed to occur in the absence of plants. *P. rapae* lays one egg and continues to fly in search of another plant if there are an abundance of plants that are conducive to oviposition **(Hiiesaar *et al.*, 2002).** *P. rapae* eggs contain a deterrent pheromone that prevents all butterflies from laying eggs on the same leaf **(Hern *et al.*, 1996)**.

According to the findings of the experiment with the Krutkaiser and Parel variants, it can be concluded that females laid duplicate eggs on the Krutkaiser variety since larvae were visible for an extended period of time **(Chew, 1988 and Ives, 1978)**. The number of eggs laid in the initial clutch or the total number of clutches produced per treatment did not indicate that female P. rapae demonstrated impact preference for one plant over the other **(Wheeler and Halpern, 1999; Schoonhoven *et al.*, 2005).**

However, *P. rapae* did exhibit a tendency to lay their initial clutch on aphid-infested plants, with the result that up to 65% of them choose better plants. More research is required to determine whether *P. brassicae* females can choose between the two plants **(Gripenberg *et al.*, 2010).** The stimulus for their preference, meanwhile, may initially be difficult to detect. While it is believed that female insects would select the host plant where their offspring thrive, the priority relationship might be changed by environmental factors. If the plant is more desirable to parasitoids and predators, females may pick it as a better host. Females have recently been shown to avoid plants with root feeders considerably (**Rothschild and Schoonhoven, 1977)**. It may be possible to determine in this trend if the impact-induced priority displayed by the L1 is still present in the otherwise negatively affect 15 caterpillar performances on the above-ground plant portions **(Soler *et al.*, 2010a)**.

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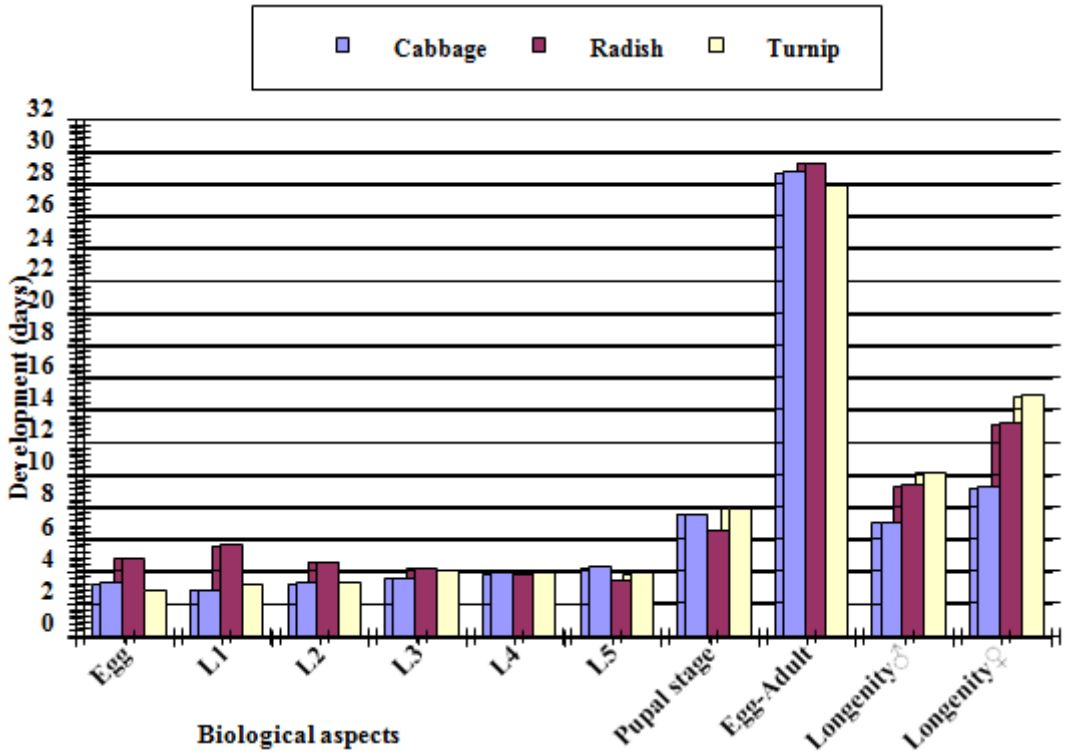

Fig.1. Development of *P. rapae* on Cabbage, Radish and Turnip under laboratory condition

Were= L1 first larval instar, L2 the second larval instar, L3 the third larval instar, L4 the fourth larval instar. And L 5 fifth larval instar.

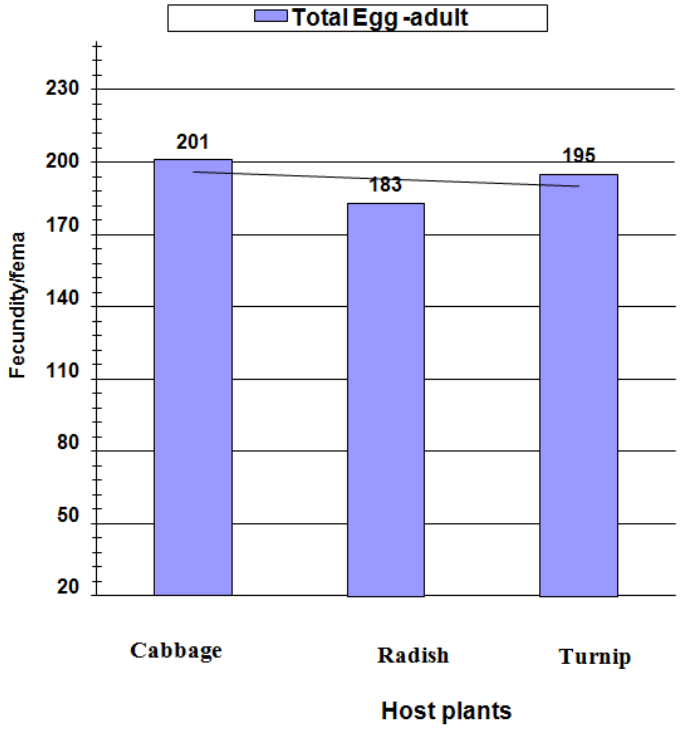

Fig. 2. Fecundity of *P. rapae* on Cabbage, Radish and under Turnip laboratory condition

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تفضيـــل العـــوائـــل النبـاتيـــــة لحشـــــرة أبـو دقيـــق الكـرنب تحـت ظـروف المعمـــل

أحمد أمين أحمد صالح ـ أيمان محمد فكري عرفة ـ سعيد عبدالفتاح محمود عامر ـ نهى حسن عصام لقمة

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – مصر

تم دراسة التطور والتكاثر لحشرة ابو دقيق الكرنب علي ثلاث عوائل نباتية الكرنب واللفت والفجل أوضحت النتائج أن لفترة النمو الكلية تأثير معنوي عل بيولوجي ابي دقيق الكرنب وكانت أقصر فترة نمو كلية 28.54 يوم عند تغذية الحشرة علي اوراق الكرنب بينما كانت أطول فترة نمو 31.80 يوم عند التغذية علي اوراق الفجل . أظهرت النتائج أن البيض بفقس بعد 3-5 أيام بمتوسط 3.29 و4.80 و2.86 يوم عند تغذية ابي دقيق الكرنب علي أوراق الكرنب واللفت والفجل علي التوالي .وبينت النتائج أن ليرقة ابي دقيق الكرنب خمس أعمار يرقية وان فترة النمو الكلية لليرقة تأثير معنوي وكان أقصر فترة نمو كلي لليرقة 17.68 يوم عند التغذية علي أوراق الكرنب وكان أطول فترة نمو 23.57 يوم عند تغذيته علي أوراق اللفت. وأظهرت النتائج أن طول حياة الحشرة الكاملة لابي دقيق الكرنب تأثير معنوي عند تغذيتة علي نبات الفجل . وكان اعلي معدل وضع بيض 201 بيضة عند التغذية علي اوراق الكرنب بينما كان اقل معدل لوضع البيض 183 بيضة عند التغذية علي اوراق نبات الفجل.

المحكمـــون:

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