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Effect of Constant Temperature (20ºC, 25ºC, 30ºC, 35ºC, 40ºC) on the Development of *Parasarcophaga Ruficornis* (FAB) (*Sarcophagidae: Diptera*)

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Abstract

Forensic entomology can be defined as the knowledge of insect and its relationship with a decomposed body. Post-mortem interval (PMI) can be determined by taking into consideration the insect species, the developmental stage of the insects and surrounding temperature as the duration of the life cycle stages depends on temperature.

Parasarcophaga (Liopygia) Ruficornisis a well-known flesh fly species of medical importance, both as a myiasis-producing agent and fly seen in a forensic entomology context. *Sarcophagidae*, commonly known as flesh fly. *Parasarcophaga Ruficornis* larvae were reared in the incubator at 20,25,30,35 and 40°C separately. The developmental data, temperature and relative humidity of the rearing room were recorded from the time the larvae were collected until the emergence of the adult flies. The duration of the developmental stages of *Parasarcophaga Ruficornis* for all temperatures was recorded accordingly.

Results obtained indicated that *Parasarcophaga Ruficornis* developmental stages grew normally up to 35ºC but at higher temperatures there was mortality; however, the rate of the development of the developing stages was very high at 40°C. At low temperature, the time required to complete the life cycle was highly prolonged. Thus it is very important to consider the temperature during the determination of perfect PMI. The life cycle was completed in about 21 days at 20ºC, 18 days at 25ºC, 14 days at 30ºC, 11 days at 35ºC and 10days at 40ºC.

Keywords: Forensic; Incubator; *Sarcophagid*; *Parasarcophaga Ruficornis*; Temperature

Introduction

Forensic entomology or medico-legal entomology is the study of insects associated with a human corpse in an effort to determine elapsed time since death [1]. Scope of medico legal forensic entomology not only includes arthropod involvement in criminal events such as murder, suicide and rape, but also physical abuse. When an unexpected death occurs without any witness or superficial evidence, the estimation of time of the death becomes a major concern.

Although blow flies (*Diptera: Calliphoridae*) are often used in forensic investigations, several documented cases report the presence of flesh fly larvae, suggesting that there are other fly groups of forensic importance rather than *calliphoridae*. Of these flesh fly species, specimens of *P. ruficornishas* been recorded to associate with human death scenes, as wellas from pig carcasses (*Susscrofa*); an animal experimental model in forensic entomology, the USA (Oahu island of Hawaii), and Thailand [2-6].

In general, climatic conditions, particularly temperatures, play an important role in the insect activity and carrion decomposition. Variations in climatic conditions lead to differences in the decomposition speed, insect development rate and succession pattern in different habitats, seasons and geographic locations.

Traditional estimations of time since death (namely rigor mortis and algor mortis) are generally unreliable after 72 hours and often entomologists are the only officials capable of generating an accurate approximate time interval.

Forensic entomology is very important when estimating the time since death beyond 72 hours. It is very important tool for estimating the elapsed time since death particularly when more than three days have elapsed.

Application of the entomological methods to criminal investigation requires an extensive knowledge of some factors, which interfere with the process of colonization, the development time and decomposition of the corpse by insects. Temperature effects on the development of the flies. High temperature increases the rate of development whereas low temperature decreases the growth rate. So temperature is very important factor to be taken into consideration while estimating the P.M.I. (post mortem interval) because each species has its own temperature dependent growth rate. Once we know the developmental rate of each dipteran fly at particular temperature it would be easy to find out Post mortem interval (PMI) at particular temperature. Hence to know the developmental rate of *Saracophaga ruficornis* present study is conducted [7-9].

To estimate the postmortem interval (PMI), there are two requirements to be fulfilled. First, is the correct identification of the *sarcophagids*, and second, is to establish the larval development period of the respective flesh fly species. Thus, in this paper, the larval growth of *Sarcophaga ruficornisis* studied in an incubator at controlled temperature ranges.

Materials and Methods

The collection of the carrion flies on the rotten liver and flesh of dog

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Carcass from different regions of Osmanabad district was done and flies were maintained in cage under laboratory condition for rearing and identification purpose. Flies were feeding daily on fresh beef liver and honey water. The collected flies were cultured under the laboratory condition and their identification was done. After identification pure culture of *Parasarcophaga ruficornis* was maintained [10-13]. Flies were kept under continuous observation to record the time of egg laying. As soon as *Parasarcophaga ruficornis* flies laid eggs on 17/7/15 those eggs were transferred in the incubator from the room temperature. All of the larvae were incubated inside an incubator at different constant temperatures (25°C, 30°C, 35°C, 40°C and 45°C). At each level of temperature, eggs, larvae, pupae and adult flies were observed daily. The length of the larvae and pupae were also measured. Life duration of the flies studied under five different ranges of constant temperature. The life cycle and duration of different maintained temperature conditions were determined. The instar stages of the preserved larvae were recorded by determining the number of posterior spiracle and the lengths of the larvae were measured using 1.0 mm x 1.0 mm graph paper [13].

The developmental data, temperature and relative humidity of the rearing room were recorded from the time the larvae were collected until the adult emergence. The temperature and humidity were recorded by using Hygro- thermometer (Mextech TM-1, Humidity Temperature Clock) [14].

Discussion

The eggs of this genus fly hatch in the female fly's reproductive tract, and therefore it lays first instar larvae. The succession of arthropods development is mostly affected and influenced by temperature and humidity [15,16]. In warmer temperature and high moisture condition, insects have been known to grow faster. The opposite conditions have also been noted to retard insect growth significantly.

In this study the lowest temperature used was 25ºC. At this temperature, development of the insect was the slowest compared to other temperature. Similar result was also noted by Payne and Smith [17].

Constant temperature increases the duration to complete the life cycle, reduce the activity and causes mortality. Entomological evidences found in criminal scene around the corpse should be collected and preserved according to medico-legal standard procedures.

In warmer temperature and high moisture condition, insects have been known to grow faster. The opposite conditions have also been noted to retard insect growth significantly [18].

In Riyadh, Saudi Arabia, Amoudiet studied the developmental rate of *Parasarcophaga (Liopygia) ruficornis (Diptera: Sarcophagidae)*, and reported at the constant temperature of 28ºC; the mean development times for feeding larvae, wandering larvae, pupae, and total development were 86.4 ± 8.6, 76.8 ± 12.2, 273.6 ± 13.7, and 436.8 ± 15.4 hours, re-spectively.

Fahad and Zambre have studied the effects of temperature on the development of Calliphorid fly of forensic importance *Chrysomya* at Constant temperature. He observed that Low temperature not only delays the duration of life cycle but also have impact on the morphological parameters like length, width and weight. At normal room temperature in rainy season the length, width and weight of second instar were 8.4 ± 0.16 mm 1.8 ± 0.66 mm and 23.2 ± 0.37 mg respectively. While at low temperature, 10 ± .05°C the length, width and weight of second instar larvae were 6.8 ± 0.16 mm 1.4 ± 0.08 mm and 18.5 ± 0.67 mg. Thus in rainy season the duration required from laying of eggs to reaching the second instar was 77 hrs. (3.21 days), but at constant low temperature same period was 153 hrs. (6.38 days). In rainy season the total larval duration was 143 hrs. (5.96 days) at room temperature, while at low temperature it was 343 hrs. (14.29 days). The pupal stage remained for 122 hrs. (5.08 days) at room temperature in rainy season while at low temperature (10°C) it was 266 hrs. (11.08 days) [19,20].

Fahad and Zambre have studied study the effect of temperature on the life cycle of *Chrysomya rufifaciesin* different season. T.K Kumara also have studied the larval growth of Liosarcophaga dux Thompson (*Diptera*: *Sarcophagidae*) was studied under varying indoor room temperatures in Malaysia [21].

Grassberger M [15] has studied the effect of Temperature on Development of *Liopygia* (*Sarcophaga*) argyrostoma (*Robineau-Desvoidy*) (*Diptera*: *Sarcophagidae*). He observed larval growth under different constant temperature regimes (8°C, 15°C, 20°C, 25°C, 30°C and 35°C, respectively), and he found that the length of larval development varies with the period of the environmental light cycle. He observed longer developmental duration for larval and pupal stages at 20°C Development time from ovi position to adult emergence was shortest (mean 14.9 - 0.4 days) at 35°C and longest (mean 54.9-1.45 days) at 15°C. At 8°C the larvae did not complete development and frequently died between the 13th and 19th day.

Observation and Results

In this study the developmental rate of *Parasarcophaga ruficornisis* studied under constant temperature. This study can contribute in the monitoring and providing important control strategies of the *Parasarcophaga ruficornisfly*. Due to increase of forensic entomology and its applications it is very important to understand the rate of development of all dipteran flies in accordance with varied temperature ranges. This is needed in more precise postmortem interval

(PMI) estimates. Larval growth rate is dependent on its body temperature which is directly affected by environmental conditions such as ambient temperature and the heat generated by maggot aggregations. Every dipteran fly has its own temperature dependent growth rate. This data is needed for accurate PMI (Figure 1). Table 1 show the period of time taken by larvae to reach adulthood at 20°C and the recorded time was 21 days. *Sarcophaga ruficornis* transforms in first instar in four hours. When the temperature rose from 20°C to 25°C larvae reaches adult in 18 days, and in three hours they changed into

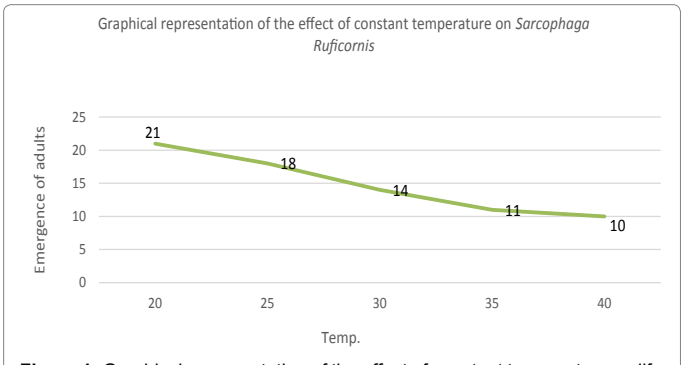

Figure 1: Graphical representation of the effect of constant temperature on life cycle of *Sarcophaga Ruficornis*.

first instar. Different parameters observed during the study are shown in Tables 2 and 3 shows a further increase in the temperature by 30°C. At this temperature there is slight decrease in the period taken by larvae to reach adult and it was 14 days. Due to increased temperature time taken to transform into first instar was comparatively low. Within two hours they transformed into first instar. When the temperature was increased to 35°C, the larvae grew very rapidly. *Sarcophaga ruficornis* reaches adult stage only within 11 days and within 45 minutes they turned into first instar. As shown in Table 4. Table 5 shows the effect of 40°C temperature on the life cycle of *Sarcophaga ruficornis* when temperature was 40°C the larvae grew much more rapidly but *Sarcophaga ruficornis* shows mortality at this stage. Within 3 minutes they turned into the first instar. Somehow they reached adult stage within 10 days. Different parameters observer during the study are shown in Tables 5 and 6 [22].

Conclusion

It is observed that temperature affects the life cycle of *Sarcophaga ruficornis*. Low temperature increases the duration to complete the life cycle whereas high temperature decreases the duration to complete the life cycle. When temperature is high development of the *Sarcophaga ruficornis* is fast and it decreases at low temperature.

This study has major implications in forensic science. Firstly, by using this data for larva rearing in forensic entomology cases, estimated time of death could be obtained in half the time compared with current rearing techniques. Secondly, slight variation in temperature and humidity will influence larval growth and indirectly influence estimation of time of death. Thus to ensure a more accurate estimation of time of death, history of surrounding temperature and humidity in the location where a body was found must be taken into consideration.

Sr.No	Date	Stage	Time	Weight in mg.	Length in mm	Humidity in incubator	Normal Temp.		Normal Humidity	
							Max.	Min	8.30am	5.30pm
1	27.07.15	Eggs/Larvae	1.30pm	0.000	0.1	70	29	23.4	73	68
2	27.07.15	I	5.30pm	0.002	0.2	75	29.4	22.6	77	62
3	28.07.15	II	10am	0.06	0.4	78	28.5	22.2	77	90
4	29.07.15	III	10am	0.012	0.7	79	30.2	22.7	85	65
5	30.07.15	Prepupa	10am	0.018	0.9	75	31.4	22.5	84	62
6	31.08.15	Prepupa	10am	0.028	1.0	78	33	22	84	57
7	01.08.15	Prepupa	10am	0.036	1.1	80	31.7	23	84	57
8	02.08.15	Prepupa	10am	0.048	1.2	77	32	22.6	79	53
9	03.08.15	Prepupa	10am	0.058	1.2	79	24	23.5	88	97
10	04.08.15	Prepupa	10am	0.064	1.4	81	23.6	21	97	98
11	05.08.15	Pupa	10am	0.068	1.4	78	23.6	21.8	100	98
12	06.08.15	Pupa	10am	0.069	1.1	79	29	21.7	92	71
13	07.08.15	Pupa	10am	--	---	78	30.4	23	85	71
14	08.08.15	Pupa	10am	--	--	76	31.4	22.4	87	51
15	9.08.15	Pupa	10am	--	--	78	30.8	23	85	72
16	10.08.15	Pupa	10am	--	--	75	31.6	22.5	84	66
17	11.08.15	Pupa	10am	--	--	79	31.2	22.9	89	70
18	12.08.05	Pupa	10am	--	--	80	32	23.2	84	60
19	13.08.15	Pupa	10am	--	--	81	33	24.6	78	63
20	14.08.15	Pupa	10am	--	--	80	32.4	23.4	75	48
21	15.08.15	Pupa	10am	--	--	81	32.6	21.4	74	53
22	16.08.15	Adult	9am	--	--	78	32	22.4	72	56

Table 1: Effect of temperature on life cycle of *Sarcophaga Ruficornis* at 20 ± 1°C.

Sr.No	Date	Stage	Time	Weight in mg.	Length in mm	Humidity in incubator	Normal Temp.		Normal Humidity	
							Max.	Min.	8.30am	5.30pm
1	27.07.15	Eggs/Larvae	12.30pm	0.000	0.000	70	29	23.4	73	68
2	27.07.15	I	3.00 pm	0.002	0.12	73	29.4	22.6	77	62
3	28.07.15	II	10am	0.017	0.4	75	28.5	22.2	77	90
4	29.07.15	III	10am	0.046	0.7	77	30.2	22.7	85	65
5	30.07.15	Prepupa	10am	0.058	0.9	80	31.4	22.5	84	62
6	31.08.15	Prepupa	10am	0.062	1	78	33	22	84	57
7	01.08.15	Prepupa	10am	0.066	1.3	79	31.7	23	84	57
8	02.08.15	Prepupa	10am	0.068	1.2	80	32	22.6	79	53
9	03.08.15	Pupa	10am	0.067	--	81	24	23.5	88	97
10	04.08.15	Pupa	10am	--	--	78	23.6	21	97	98
11	05.08.15	Pupa	10am	--	--	77	23.6	21.8	100	98
12	06.08.15	Pupa	11am	--	--	79	29	21.7	92	71

13	07.08.15	Pupa	10am	--	--	78	30.4	23	85	71
14	08.08.15	Pupa	10am	--	--	80	31.4	22.4	87	51
15	9.08.15	Pupa	10am	--	--	79	30.8	23	85	72
16	10.08.15	Pupa	10am	--	--	76	31.6	22.5	84	66
17	11.08.15	Pupa	10am	--	--	77	31.2	22.9	89	70
18	12.08.05	Pupa	10am	--	--	80	32	23.2	84	60
19	13.08.15	Adult	11am	--	--	81	33	24.6	78	63

Table 2: Effect of temperature on life cycle of *Sarcophaga Ruficornis* at 25 ± 1°C.

Sr.No.	Date	Stage	Time	Weight in mg	Length in mm	Humidity in incubator	Normal Temp.		Normal Humidity	
							Max.	Min.	8.30am	5.30pm
1	14.08.15	Eggs/Larvae	12pm	0.000	0.00	68	29.8	22.8	92	73
2	14.08.15	I	2.00pm	0.001	0.4	69	30.4	22.8	86	74
3	15.08.15	II	10am	0.005	0.7	70	31.6	22.5	84	66
4	16.08.15	III	10am	0.014	0.9	73	31.2	22.9	89	70
5	17.08.15	Prepupa	10am	0.025	1.0	75	32	23.2	84	60
6	18.08.15	Prepupa	10am	0.033	1.03	78	33	24.6	78	63
7	19.08.15	Prepupa	10am	0.034	1.04	58	32.4	23.4	75	48
8	20.08.15	Pupa	10am	0.035	1.01	70	32	22.4	72	56
9	21.08.15	Pupa	4pm	--	--	68	31.4	22.4	84	53
10	22.08.15	Pupa	10am	--	--	71	32.4	21.8	77	49
11	23.08.15	Pupa	10am	--	--	70	32.2	22.2	75	61
12	24.08.15	Pupa	10am	--	--	69	31.2	22.4	78	66
13	25.08.15	Pupa	4pm	--	--	70	33.4	22.5	78	60
14	26.08.15	Pupa	10am	--	--	69	32.4	22.7	84	63
15	27.08.15	Adult	11am	--	--	70	33.2	23	84	63.5

Table 3: Effect of temperature on life cycle of *Sarcophaga Ruficornis* at 30 ± 1°C.

Sr.No.	Date	Stage	Time	Weight in mg	Length in mm	Humidity in incubator	Normal Temp.		Normal Humidity	
								Min.	8.30am	5.30pm
1	14.08.15	Eggs/Larvae	2pm	0.000	0.01	58	29.8	22.8	92	73
2	14.08.15	I	2.45pm	0.001	0.03	60	30.4	22.8	86	74
3	15.08.15	II	10am	0.005	0.6	62	31.6	22.5	84	66
4	16.08.15	III	10am	0.014	0.9	70	31.2	22.9	89	70
5	17.08.15	Prepupa	10am	0.018	1.03	68	32	23.2	84	60
6	18.08.15	Prepupa	10am	0.022	1.5	60	33	24.6	78	63
7	19.08.15	Pupa	10am	0.021	1.01	67	32.4	23.4	75	48
8	20.08.15	Pupa	10am	--	--	69	32	22.4	72	56
9	21.08.15	Pupa	10am	--	--	62	31.4	22.4	84	53
10	22.08.15	Pupa	10am	--	--	69	32.4	21.8	77	49
11	23.08.15	Pupa	10am	--	--	70	32.2	22.2	75	61
12	24.08.15	Adult	9am	--	--	69	31.2	22.4	78	66

Table 4: Effect of temperature on life cycle of *Sarcophaga Ruficornis* at 35 ± 1°C.

Sr.No	Date	Stage	Time	Weight in mg	Length in mm	Humidity in incubator	Normal Temp.		Normal Humidity	
							Max.	Min.	8.30am	5.30pm
1	29.08.15	Eggs/Larvae	1pm	0.000	0.1	59	31	23.1	87	66
2	29.08.1	I	1.30pm	0.001	0.4	63	31.4	22.8	84	66
3	30.08.15	II	10am	0.005	0.7	60	31.4	23	84	61
4	31.09.15	III	10am	0.014	1.01	58	32.2	23.6	84	58
5	01.09.15	Prepupa	10am	0.018	1.03	62	31.4	22.5	89	50
6	02.09.15	Prepupa	11am	0.020	1.04	66	33.2	21.8	66	50
7	03.09.15	Pupa	10am	0.22	1.02	57	32.8	22.2	76	95
8	04.09.15	Pupa	10am	--	--	60	32.4	21.5	86	68
9	05.09.15	Pupa	10am	--	--	62	31.7	22.6	84	95
10	06.09.15	Pupa	10am	--	--	65	31.5	22.9	69	58
11	07.09.15	Adult	1.30Pm	--	--	66	31.6	22.7	69	58.3

Table 5 Effect of temperature on life cycle of *Sarcophaga Ruficornis* at 40 ± 1°C.

Days	20°C	25°C	30°C	35°C	40°C
01	Eggs/Larvae	Eggs/Larvae	Eggs/Larvae	Eggs/Larvae	Eggs/Larvae
01	IInstar	I	I	I	I
02	IIInstar	II	II	II	II
03	IIIInstar	III	III	III	III
04	Prepupa	Prepupa	Prepupa	Prepupa	Prepupa
05	Prepupa	Prepupa	Prepupa	Prepupa	Prepupa
06	Prepupa	Prepupa	Prepupa	Pupa	Pupa
07	Prepupa	Pupa	Pupa	Pupa	Pupa
08	Prepupa	Pupa	Pupa	Pupa	Pupa
09	Prepupa	Pupa	Pupa	Pupa	Pupa
10	Pupa	Pupa	Pupa	Pupa	Adult
11	Pupa	Pupa	Pupa	Adult	
12	Pupa	Pupa	Pupa		
13	Pupa	Pupa	Pupa		
14	Pupa	Pupa	Adult		
15	Pupa	Pupa			
16	Pupa	Pupa			
17	Pupa	Pupa			
18	Pupa	Adult			
19	Pupa				
20	Pupa				
21	Adult				

Table 6: Time duration required to complete the life cycle stages of *Sarcophaga Ruficornis* at different temperatures.

References

1. Goodbrod JR, Goff ML (1990) Effects of larval population-density on rates of development and interactions between two species of *Chrysomya (Diptera, Calliphoridae)* in laboratory culture. J Med Entomol 27: 338-343.
2. AbdAlgalil FM, Zambare SP (2015) Effects of temperature on the development of calliphorid fly of forensic importance *Chrysomya megacephalya* (Fabricius, 1794). Indian Journal of Applied Research 5: 767-769.
3. Abd Algalil FM, Zambare SP (2015) Effect of temperature on the development of Calliphortid of forensic importance *Chrysomya rufifacies* (Macqart, 1842). International Journal of Advanced Research 3: 1099-1103.
4. Amoudi MA, Diab FM, Abou-Fannah SM (1994) Development rate and mortality of immature *Parasarcophaga* (*Liopygia*) ruficornis *(Diptera: Sarcophagidae)* at constant laboratory temperatures. J Med Entomol 31: 168-70.
5. Al-Misned FAM (2004) Effect of temperature on development and mortality of immature *Sarcophaga* (*Liosarcophagad*) dux Thomson *(Diptera: Sarcophagidae)* J. King Saud UnivAgriSci 16:53-60.
6. Byrd JH, Castner JL (2002) Entomological evidence: Utility of Arthropods in Legal Investigations. CRC Press, Boca Raton.
7. Byrd JH, Butler JF (1998) Effects of temperature on *Sarcophaga haemorrhoidalis (Diptera: Sarcophagidae*) development. Journal of Medical Entomology 35: 694–698.
8. Bharti M, Singh D, Sharma YP (2007) Effect of temperature on the development of forensically important blow fly, *Chrysomyamegacephala (Fab.) (Diptera: Calliphoridae)*. Entomol 32: 149-151.
9. Campobasso CP, Disney RHL, Introna FA (2004) Case of *Megaseliascalaris (Diptera: Phoridae)* Breeding in Human Corpse. Aggarwal's Internet Journal of Forensic Medicine and Toxicology 5: 3-5.
10. Cammack JA, Nelder MP (2010) Cool-weather activity of the forensically important hairy maggot blow fly *Chrysomyarufifacies (Macquart) (Diptera: Calliphoridae)* on carrion in Upstate South Carolina, United States. Forensic Sci Int 195: 139-142.
11. Nolte KB, Pinder RD, Lord WD (1992) Insect larvae used to detect cocaine poisoning in a decomposed body. J Forensic Sci 37: 1179-1185.
12. Goff ML, Lord WD (1994) Entomotoxicology. A new area for forensic investigation. Am J Forensic Med Pathol 15: 51-57.
13. Gomes L, Gomes G, Von Zuben CJ (2009) The influence of temperature on the of burrowing in larvae of the blow flies, *Chrysomya albiceps* and *Lucilia cuprina*, under controlled conditions. J. Insect Sci 9: 14.
14. Grasberg M, Reiter C (2002) Effect of temperature on development of the forensically important holarctic blow fly *Protophormia terraenovae (Robineau-Desvoidy) (Diptera: Calliphoridae)*. Forensic Science International 128: 177-182.
15. Grassberger M (2002) Effect of temperature on development of *Liopygia (Sarcophaga) argyrostoma (Robineau-Desvoidy) (Diptera: Sarcophagidae)* and Its Forensic Implications. J Forensic Sci 47: 1332-1336.
16. Ames C, Turner B (2003) Low temperature episodes in development of blow flies: implications for postmortem Interval estimation. Med Vet Entomol 17: 178-186.
17. Smith KGV (1986) A manual of forensic entomology, Trustees of the British Museum.
18. Sukontason K, Piangiai S, Siriwattanarungsee S (2008) Morphology and developmental rate of blowflies *Chrysomya megacephala* and *Chrysomya rufifacies* in Thailand :application in forensic entomology. Parasitol Res 102: 1207-1216.
19. Niederegger S, Pastuschek J, Mall G (2010) Preliminary studies of the influence of fluctuating temperatures on the development of various forensically relevant flies. Forensic Sci. Int. 199: 72-78.
20. Verma GP, Ishikawa M (1984) Oogenesis in a flesh fly, *Sarcophaga ruficornis*. Development, Growth and Differentiation 26: 591-597.
21. Kumara TK, Hassan AA, Salmah MR, Bhupinder S (2013) Larval growth of *Liosarcophaga dux* Thompson *(Diptera: Sarcophagidae)* under controlled indoor temperatures in Malaysia, Southeast Asian. J Trop Med Public Health. 44: 182-187.
22. Tachibana JW, Numata H (2004) Effects of temperature and photoperiod on the termination of larval diapause in *Luciliasericata (Diptera: Calliphoridae)*. Zoological Science 21: 197–202.

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