Journal of Experimental Sciences 2011, 2(9): 13-15
ISSN: 2218-1768
www.scholarjournals.org

journal of experimental sciences

www.jexpsciences.com

JES-Life Sciences

Studies on Hydrogen-ion-concentration in Tasar Silkworm (*Antheraea proylei Jolly*)

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Article Info

Article History

Received : *05-05-2011*
Revised : *11-07-2011*
Accepted : *12-07-2011*

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Abstract

Silk is a proteinaceousfibresynthesised by the silkworms from a specialized organ known as silkglands which are nothing but the modified labial glands of certain lepidopteran insects. The hydrogen- ion concentration in the larval haemolymph, silkgland and food leaves of *Antheraea proylei* has been determined by **" Indicator paper technique"** and**" Universal indicator technique"**. The pH of larval haemolymph and silk gland has been found in range 6.0-6.5 each and 5.5-6.2 in the food leaves. The mean values of haemolymph, silkgland and food leaves have been calculated to be 6.3±0.0596, 6.21±0.0586 and 5.88±0.0772 respectively. The multiple correlation co-efficient of silkgland on haemolymphand food has been found to be R^2=93.6% and significant at 1% level.

Key Words: Hydrogen ion concentration,Silk worm

Introduction

Silk is a proteinaceous fibre synthesised by the silkworms from a specialized organ known as silkglands which are nothing but the modified labial glands of certain lepidopteran insects. The oak tasar *Antheraea proylei Jolly* is a serigenous insect. It is a fertile hybrid between *Antheraea pernyi* of China and *Antheraea proylei* of India. It feeds onthe leaves of *Quercus serrata* Thumb. (Oak) and has become endemic to Manipur. The oak tasar silkworm, This silkworm and its host plants have become prone to attack of numerous pests, predators and microbial diseases. As such many physiological disorders have been reported to occur in its physiological processes. In order to procure healthy cocoon and better yield, it needs to be protected. This would be possible only when one knows food, feeding and certain aspects of digestive physiology of such an insect in correlation with its host plant. The hydrogen- ion concentration plays a vital role during insect metabolism. It varies from species to species. But there seems no relation between the family and the food of the larvae to pH value (Srivastava and Mathur, 1966). Similarly, the food and the starvation also have no influence on the hydrogen-ion concentration in the digestive tract in lepidopteran larvae (Prasad and Shukla, 1975). A quite good amount of work has been done on hydrogen-ion concentration by many workers like David (1927), Waterhouse (1949), Srivastava (1957), Srivastava and Srivastava (1961) and Lal and Ghai (1958). But no work seems to have been done on this particular insect to its food leaves. The present piece of work has therefore been undertaken to know the correlation between the hydrogen-ion concentration of haemolymph, silkgland and food leaves of full grown *A. proylei* larvae.

Materials and Methods

The experimental insect, full grown larvae of *A. proylei* and food leaves were collected from the Regional Tasar Research Station, Mantripukhri. The haemolymph as well as extract of silkgland was prepared from alive larvae.

The determination of hydrogen-ion- concentration in the haemolymph, silkgland and food leaves were done by "Indicator paper technique" and "Universal indicator technique". David (1927) and Waterhouse (1949) discussed the merits and demerits of this technique. In spite of this, these technique were found suitable for the present investigation because of the fact that the quantity of the haemolymph and the fluid of the silkgland was too little to be measured by pH meter. So, the two techniques suggested by above workers have been adopted in the present investigation.

Result and Discussion

The hydrogen-ion concentration in the haemolymph and silkgland of *A. proylei* larvae ranges from 6.0-6.5 and their mean value is 6.3±0.0596 and 6.21±0.0586 respectively. It appears that larval haemolymph and silkglands are slightly acidic. In the food leaves the pH ranges from 5.5-6.2 and their mean value is 5.88±0.0772. Therefore, the pH in the food leaves is also more acidic than those of haemolymph and silkglands. Marshall (1939), Pant et al. (1959) and many other workers determined the pH of blood in insect and various other parts of their body. But they did not mention anything about the pH in the silkglands of silkworms. Marshall (1939) studied the hydrogen- ion- concentration of silkworm.

Determination of the hydrogen-ion-Concentration in the gastric juice and blood of the coddling moth larva, *Corpocapsa pomonella* and showed that the digestive fluids were evidently well buffered. He further mentioned that the pH of the blood of both 4th and 5th instar ranges between 6.7 and 6.8 Pant *et al* (1959) determined the pH of the blood, salivary glands and various parts of the alimentary canal of *Chilozonellus* and reported that the pH (7.4-7.5) slightly decreased due to starvation. But according to Prasad and Shukla (1975), the food and the starvation have no influence on the hydrogen-ion- concentration of the digestive tract in the larvae studied by them Those observations were supported by Bodine (1925) on grasshopper who noted that in animals starved for many hours, the gut have pH value similar to that found in normal individuals. Therefore according to him the starvation did not affect hydrogen – ion – concentration in the digestive tract.

The hydrogen – ion – concentration of haemolymph, silkgland and food leaves are acidic at variable range. A similar observation was conducted by Singh (1976) in *Fucus* and *Heliotropium* plants andin the fifth instar larvae of *Hypsaalcihpron* and *Utetheisae pulchella.* He reveled that pH Of the host plants is strongly acidic in nature ranging from 5.4 to 6.6 and the grown larvae have acidic (pH 6.6) each haemolymph in both the species. It appears that the hydrogen-ion-concentration of food might be having some influence on the pH of haemolymph and silkgland as there is some similarity in the final range pH of food and haemolymph of the larvae.

Table 1: Comparative chart showing the pH in the haemolymph, silkgland and food leaves of healthy full grown *A.proylei*

No of observation	Hydrogen – ion -concentration		
	Haemolymph (C_1)	Silkgland (C_2)	Food leaves (C_3)
1.	6.1	6.0	5.7
2.	6.5	6.4	6.2
3.	6.3	6.2	5.8
4.	6.1	6.0	5.6
5.	6.5	6.4	6.1
6.	6.2	6.1	5.8
7.	6.4	6.3	6.0
8.	6.0	6.0	5.5
9.	6.5	6.5	6.2
10.	6.4	6.2	6.9
Range	6.0-6.5	6.0-6.5	5.5-6.2
Mean	6.3	6.21	5.88
S.E.	±0.0596	±0.0586	±0.0772

Table II – analysis variance for the data of table I

Source of variance	Degree of freedom (DF)	Sum of square (SS)	Mean Square (MS)	Computed (F)	Percentage (P)
Regression Error	2	0.28928	0.14464		
	7	0.30900	0.00282	51.34	0.000
Total	9				

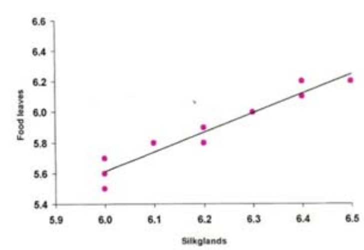

Fig. 1 Graph showing regression of hydrogen-ion concentration between the silkglands and food leaves of *A. proylei* larva.

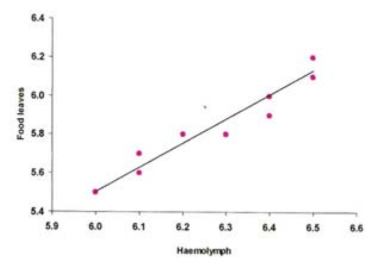

Fig.2 Graph showing regression of hydrogen-ion concentration between the haemolymph and food leaves of *A. proylei* larva.

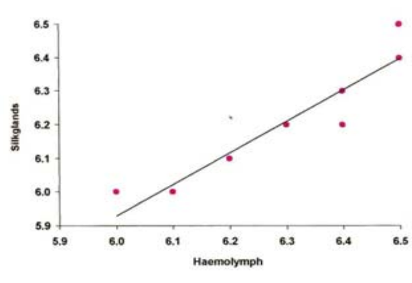

Fig. 3 Graph showing regression of hydrogen-ion concentration between the haemolymph and silkglands of full grown healthy *A. proylei* larva.

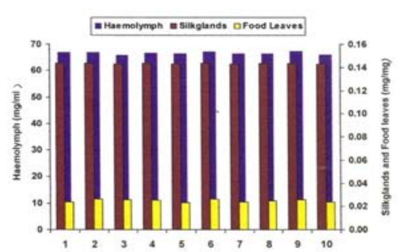

Fig. 4 Graph showing correlation between the lipids content in the haemolymph, silkglands and food leaves of the host plant, *Quercus serrata*.

Multiple regression of silk gland on haemolymph and food leaves

The regression equation is

$C_2 = 1.25 + 0.347\ C_1 + 0.472\ C_3$

The multiple correlation co-efficient of silkgland on haemolymph and food leaves is R^2= 93.6% which indicates that 93.6% of the variation is accounted by haemolymph and food leaves while 6.4% of the variation in haemolymph is explained by some other factors not considered in the present analysis. The multiple correlation co-efficient is significant at 1 % level.

Acknowledgements

The authors are thankful to the Head, Department of Zoology and Principal Manipur Collage, Imphal for laboratory facilities.

References

Bodine JH (1925) Physiology of Orthoptera, Hydrogen-ion-concentration of the blood and alimentary tract of certain Orthoptera (grasshoppers). *Biol. Bull* 48,79-82

David E (1927) The application of studies in hydrogen-ion-concentration to entomological research *Ann. Ent. Soc. Amer* 20,503-512.

Lal R and Ghai S (1958) Physiology of digestion in the adult red pumpkin beetle, *Aulacophora foveicollis* Lucas. *Indian J.Ent*. 20, 503-512

Marshall J (1939) The hydrogen–ion-concentration of the digestive fluids and blood of the coddling moth larvae of *Chilo-zonellus* Swin. *Indian J.Ent*. 21, 238-245.

Pant N.C, Srivastava P D and Ghai S (1959): Physiology of digestion in the larvae of *Chilo zonellus* swin. *Indian J.Ent.* 21 238-245.

Prasad B and Shukla GS (1975) Studies on the hydrogen-ion-concentration of the digestive tract and associated structures of some sugarcane borer (Lepidoptera: Pyrallidae) *Indian J. Zoot.* 16,77- 82.

Singh DR (1976) Hydrogen –ion- concentration in the fifth instar larvae of *Hypsa alciphron* Cram and *Utetheisa pulchella Linn. Indian J.Ent*. 38,391-392.

Srivastava PD (1957) Studies on the choice of food plant and certain aspects of the digestive physiology of the larvae and adults of *Athalialugens proxima* (Klung) and *Epilachna viginctioctopunctata* (Fabr). *Bull Ent. Res*. 2,289- 297.

Srivastava U S and Srivastava P D (1961) On the hydrogen –ion-concentration in the alimentary canal of the Coleoptera, *Beitr. Ent*. 11.15-20.

Srivastava BK and Mathur LML (1966) On the hydrogen –ion –concentration in the alimentary canal and blood of phytophagous larval lepidoptera. *Indian J. Entomol*. 28, 422-426

Waterhouse DG (1949) The hydrogen –ion- concentration in the alimentary canal of larval and adult Lepidoptera. *Aust. Sci. Res*. (B) 2, 428-437.