

Basic Chemical Compositions and Antioxidant Activities of Thai Silkworm and Silkworm Pupa

Saowanee Apinyanuwat, Somchai Jomduang,
Wiroje Kaewruang, Nakorn Mahayosananand
and Jutharat Chamkratoke



The Queen Sirikit Department of Sericulture,
Ministry of Agriculture and Cooperatives
and Chiangmai University, Thailand

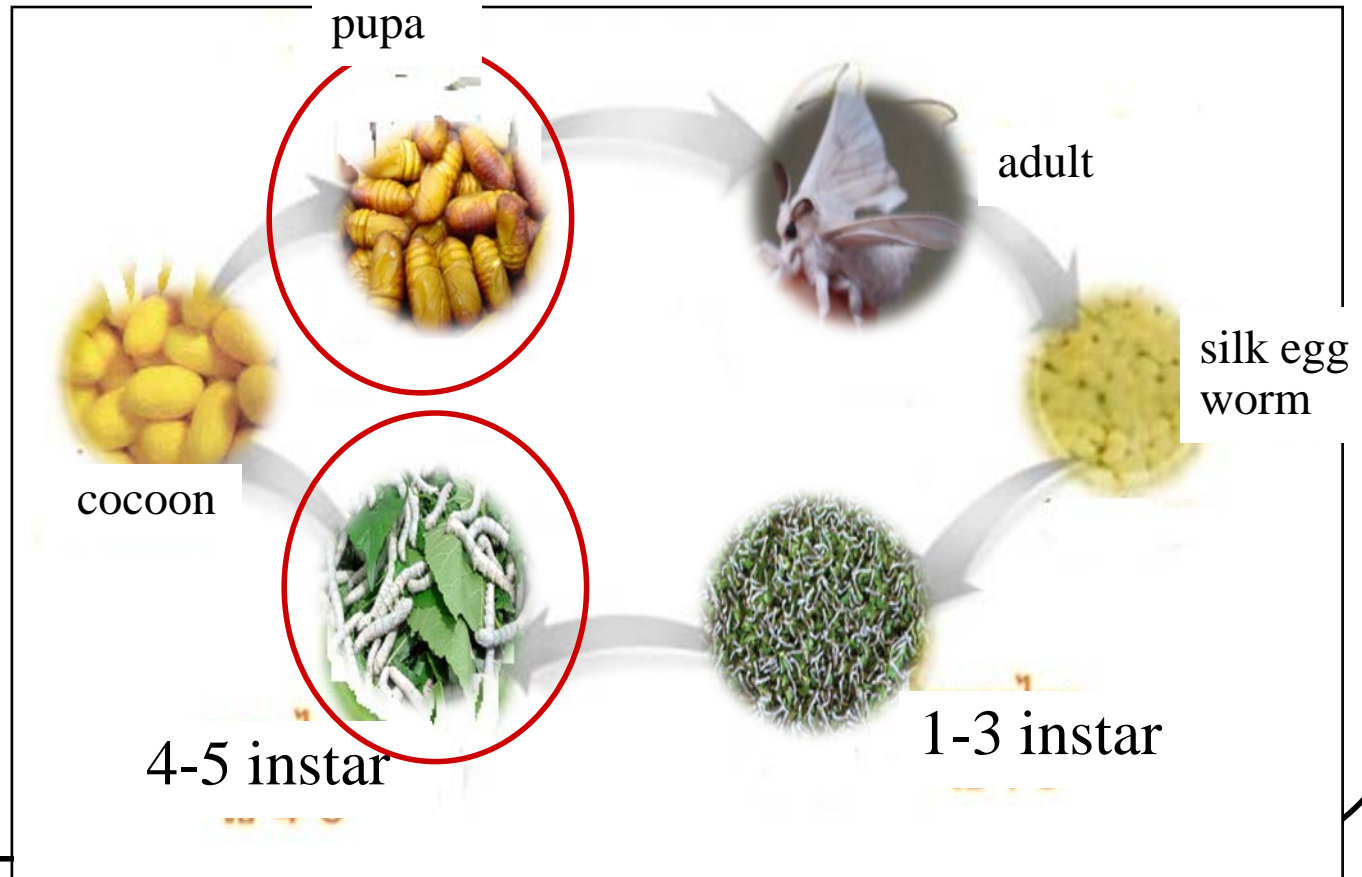




Introduction

- **Mulberry Silkworm : *Bombyx mori***
- **Life cycle of Mulberry Silkworm :**

- egg
- larva
- pupa
- moth



Introduction

- Silkworm pupa has normally obtained as a by-product during cocoon production.
- There are little information of basic chemical compositions and antioxidants activities in silkworm and silkworm pupa
- It would be the background information to created value-added and supplemented food products which would bring great benefit to sericulture in Thailand



Objective

To determine the 7 silkworm and silkworm pupa varieties on :

- **basic chemical compositions**
- **antioxidant activities**



Method

rearing silkworm



**separated sex of silkworm and
silkworm pupa**



**analytical chemical compositions
and antioxidant activities**



analytical statistic





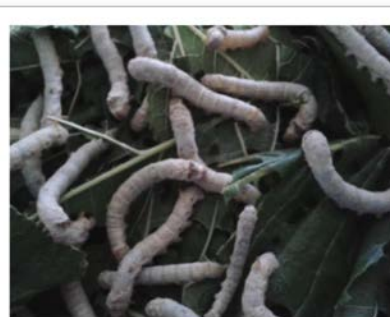
Experimental design : 7x2x2 Factorial in CRD

7 varieties

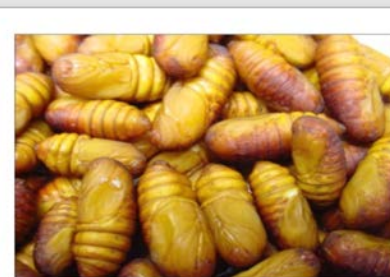
- 1) NangnoiSrisaket-1
- 2) Samrong
- 3) Nangtui ×Nangsew
- 4) Nangnoi Srisaket-1×Samrong
- 5) Ubon Ratchathani 60-35
- 6) Luang Surin
- 7) J108 x Nanglai

2 stages

- silkworm



- silkworm pupa



2 sexes

- male
- female



The results statistical were analysis by ANOVA compared analysis of variance by Duncan's New Multiple Range Test (DNMRT) at the level 95 percent of statistical confidence





Silkworms were rearing at The Queen Sirikit Sericulture Center (Chiangmai)



Nangnoi Srisaket-1



Nangnoi Srisaket-1 x Samrong



Samrong



Luang Surin



Ubun Ratchathani 60-35



Nangtui x Nangsew



J108 x Nanglai



Faculty of agro-industry, Chiangmai University





Chemical compositions analysis

**analysis composition of 7 silkworm varieties
effect to basic chemical follow as :**

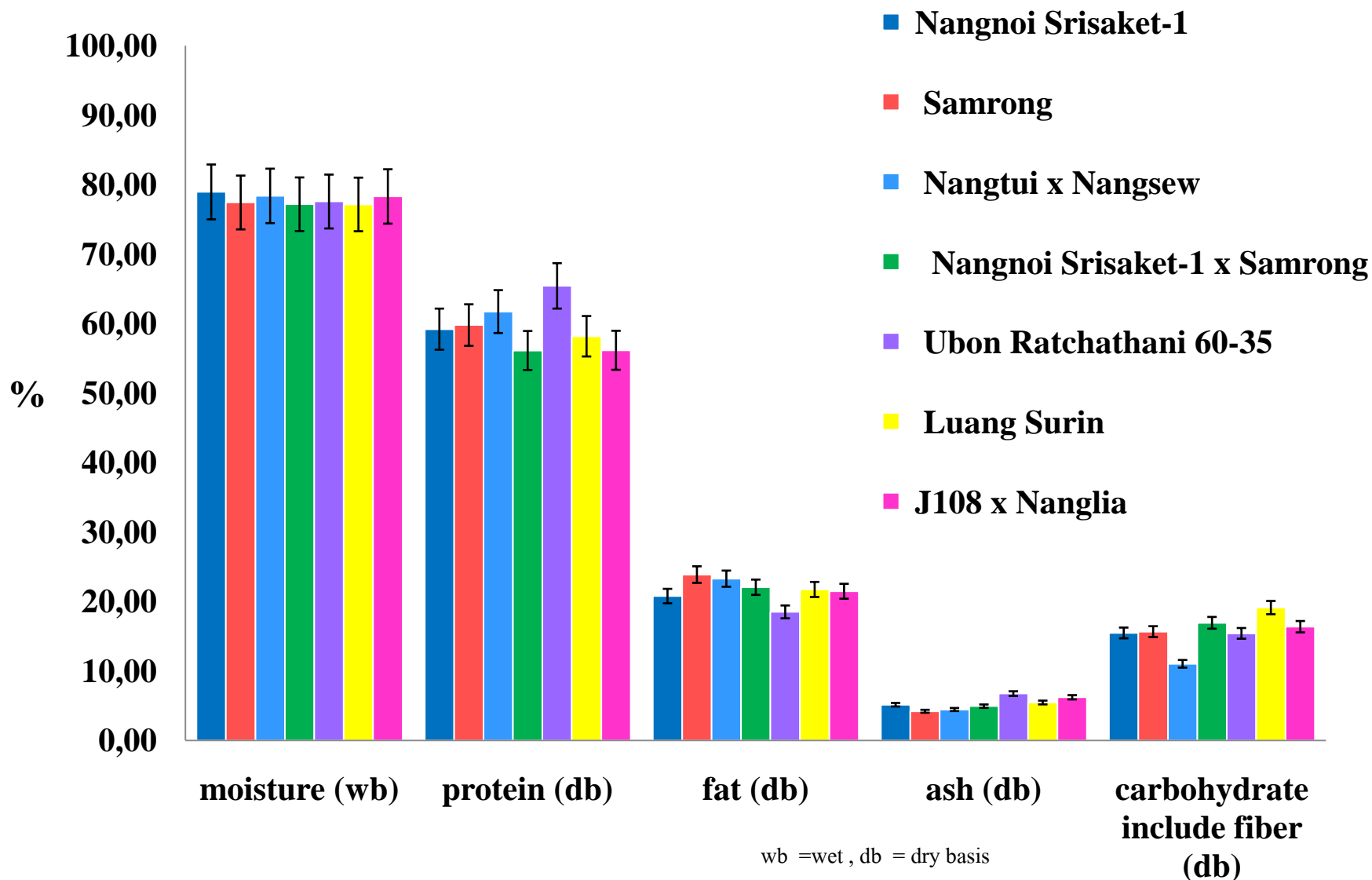
- **moisture (%wb)**
- **protein (%db)**
- **fat (%db)**
- **ash (%db)**
- **carbohydrate (%db)**



(AOAC, 2000)



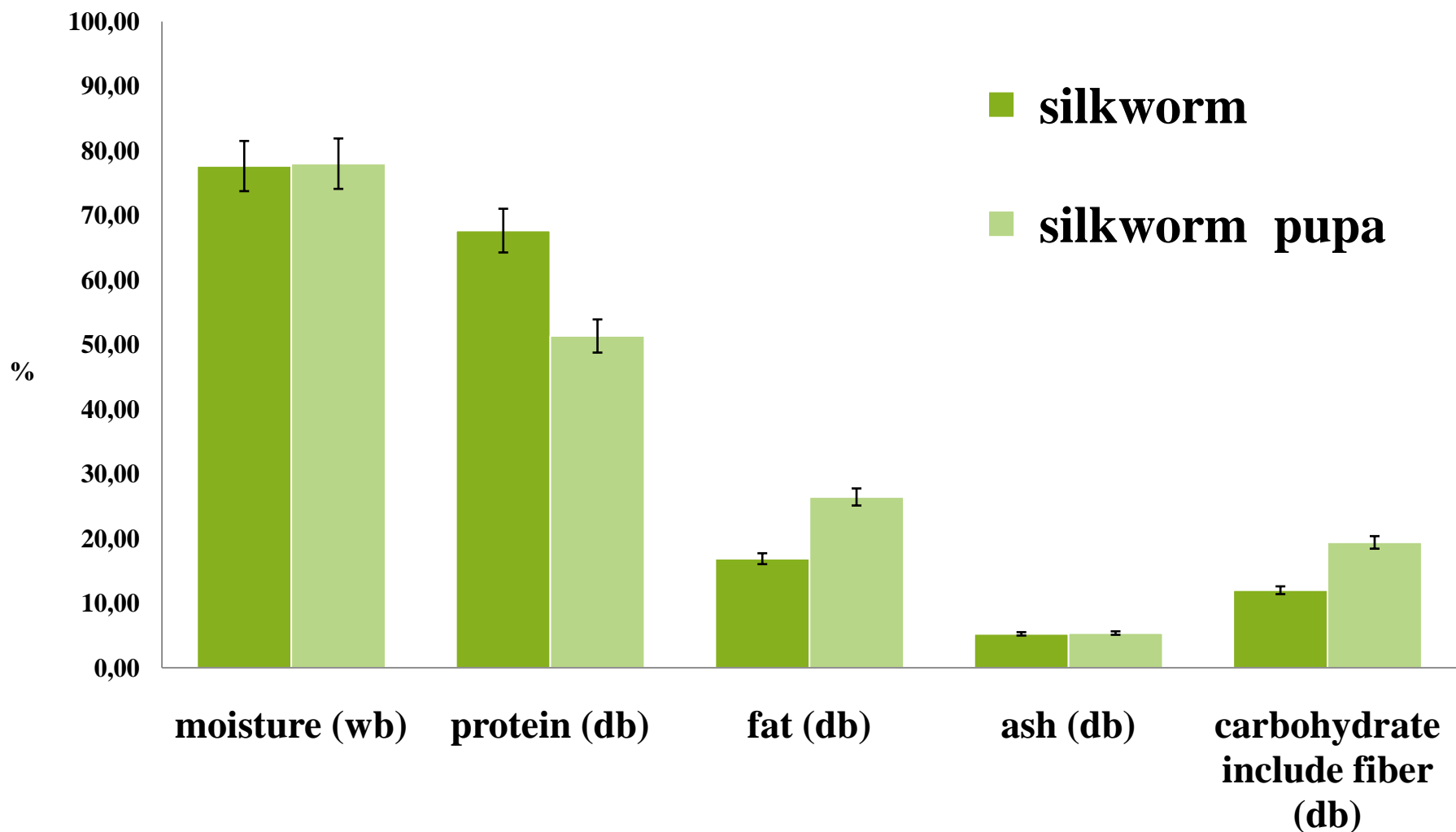
Effects of silkworm variety on their chemical composition



factor	Chemical component (%)				
variety	moisture	protein	fat	ash	carbohydrate
Nangnoi Srisaket-1	ns 78.93 ± 3.27	ns 59.18 ± 11.21	ns 20.77 ± 9.89	ns 5.13 ± 2.25	ns 15.46 ± 13.12
Samrong	77.41 ± 2.13	59.77 ± 14.45	23.86 ± 6.56	4.19 ± 1.98	15.65 ± 11.24
Nangtui ×Nangsew	78.36 ± 1.43	61.71 ± 12.15	23.27 ± 9.44	4.44 ± 2.06	11.02 ± 11.54
Nangnoi Srisaket1 ×Samrong	77.16 ± 1.65	56.11 ± 10.52	22.04 ± 7.31	4.92 ± 1.69	16.92 ± 7.36
Ubon Ratchathani 60-35	77.55 ± 0.74	65.41 ± 15.48	18.49 ± 9.49	6.73 ± 2.92	15.40 ± 13.70
Luang Surin	77.13 ± 2.65	58.16 ± 11.24	21.72 ± 9.55	6.73 ± 2.92	19.11 ± 10.69
J108xNanglai	78.28 ± 1.90	56.14 ± 12.17	21.46 ±	5.45 ± 2.44	16.36 ± 9.14



Effects of silkworm stage on their chemical composition



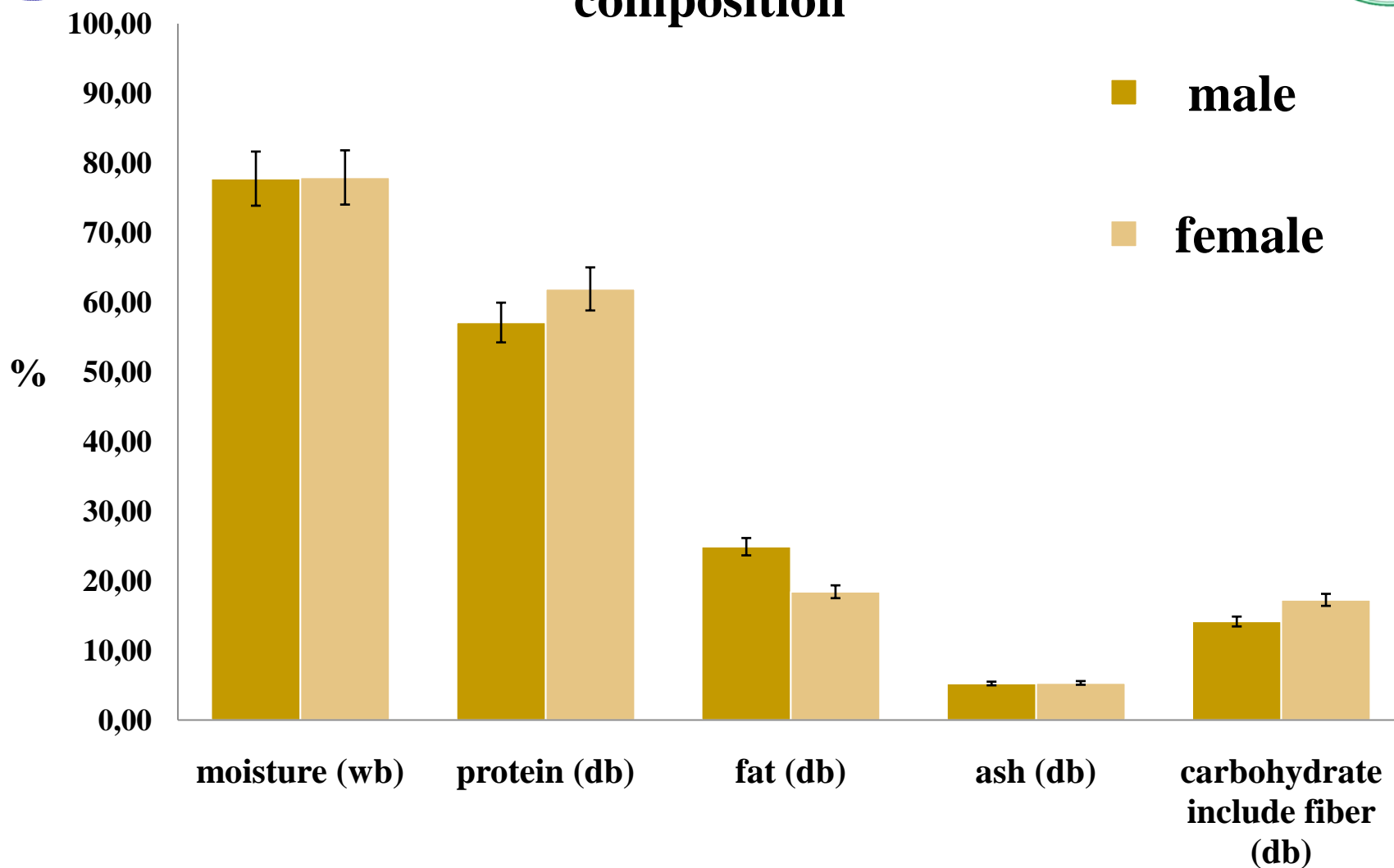
Effects of silkworm stage on their chemical composition

factor	Chemical component (%)				
<u>stage</u>	moisture	protein	fat	ash	carbohydrate
silkworm	ns 77.64 ± 2.27	<u>67.65 ± 10.21^a</u>	16.88 ± 5.75^b	ns 5.21 ± 1.03	12.00 ± 5.23^b
silkworm pupa	78.01 ± 1.93	51.34 ± 11.25^b	<u>26.43 ± 6.23^a</u>	5.37 ± 2.41	<u>19.40 ± 6.49^a</u>





Effects of silkworm sex on their chemical composition



Effects of silkworm sex on their chemical composition

factor	Chemical component (%)				
<u>sex</u>	moisture	protein	fat	ash	carbohydrate
male	ns 77.74 ± 1.56	57.08 ± 10.81^b	<u>24.89 ± 5.28^a</u>	5.25 ± 1.18	14.15 ± 5.19^b
female	77.74 ± 1.56	<u>61.91 ± 12.45^a</u>	18.42 ± 5.16^b	5.33 ± 2.57	<u>17.26 ± 6.03^a</u>

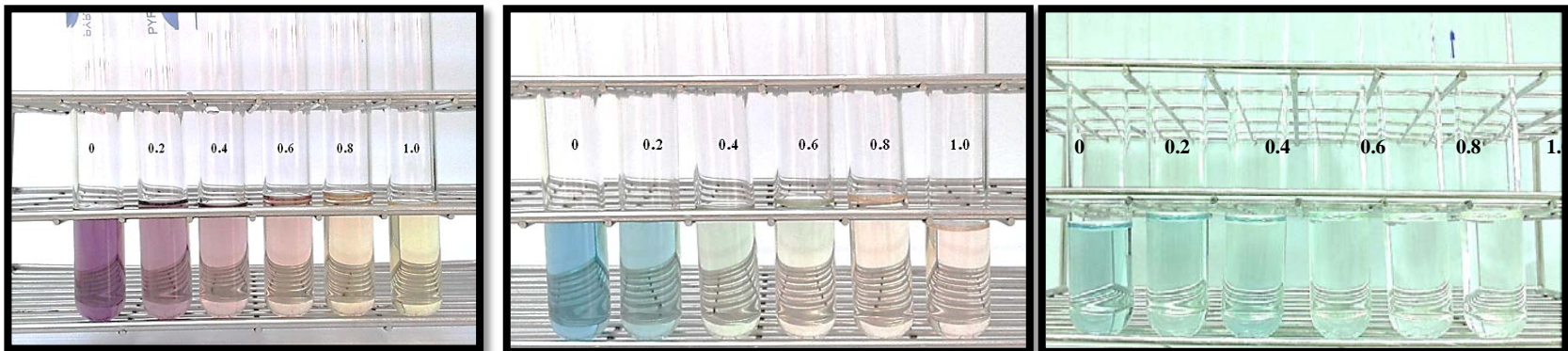
Results : chemical composition

- **variety** : all variety of silkworm and silkworm pupa was not significant differentiation
- **stage**
 - protein : silkworm > silkworm pupa
 - fat and carbohydrate : silkworm pupa > silkworm
- **sex**
 - protein, carbohydrate include fiber : female > male
 - fat : male > female



Antioxidant activity analysis

- DPPH radical scavenging activity assays (DPPH assay) (Orhan *et al.*, 2013)
- Trolox equivalents antioxidant capacity (TEAC assay) (Moreira *et al.*, 1999)
- Total radical trapping antioxidant parameter (TRAP assay) (Moreira *et al.*, 1999)





Effect of silkworm variety on their antioxidant activities

mg/ml garlic acid

1,00

0,90

0,80

0,70

0,60

0,50

0,40

0,30

0,20

0,10

0,00

■ Nangnoi Srisaket-1

■ Samrong

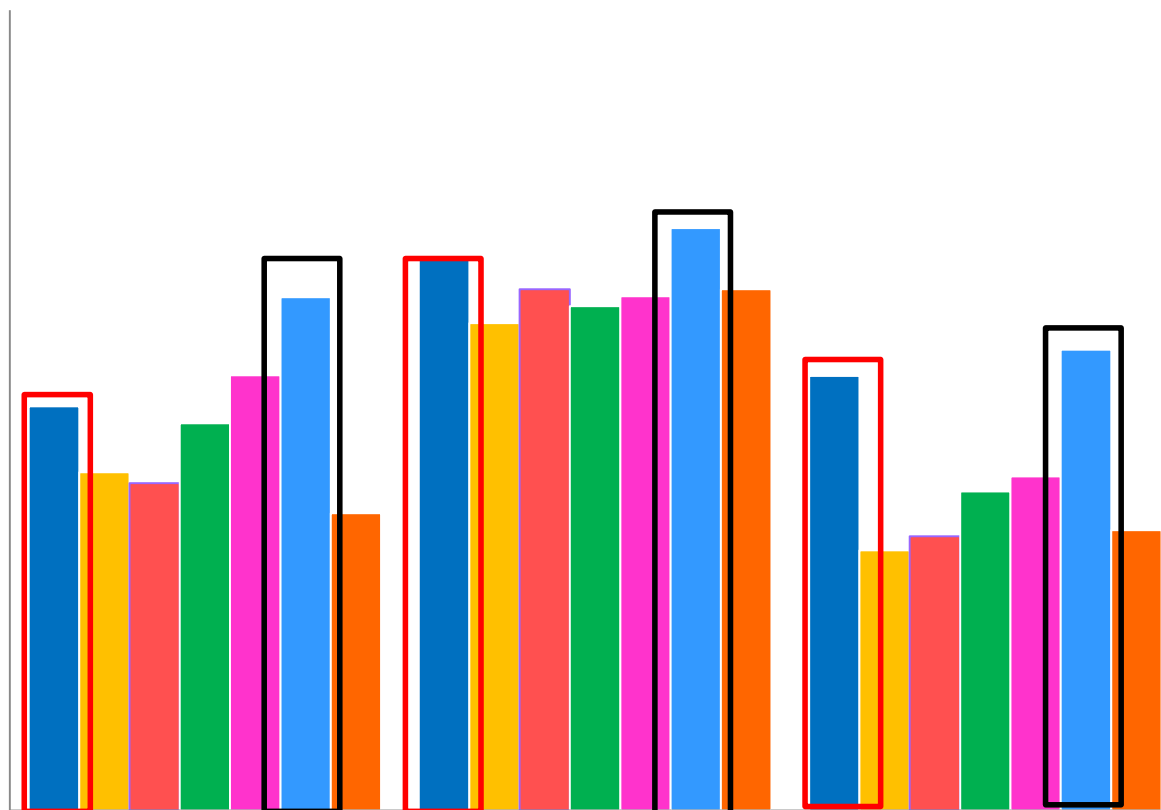
■ Nangtui x Nangsew

■ Nangnoi Srisaket-1 x Samrong

■ Ubonrathani 60-35

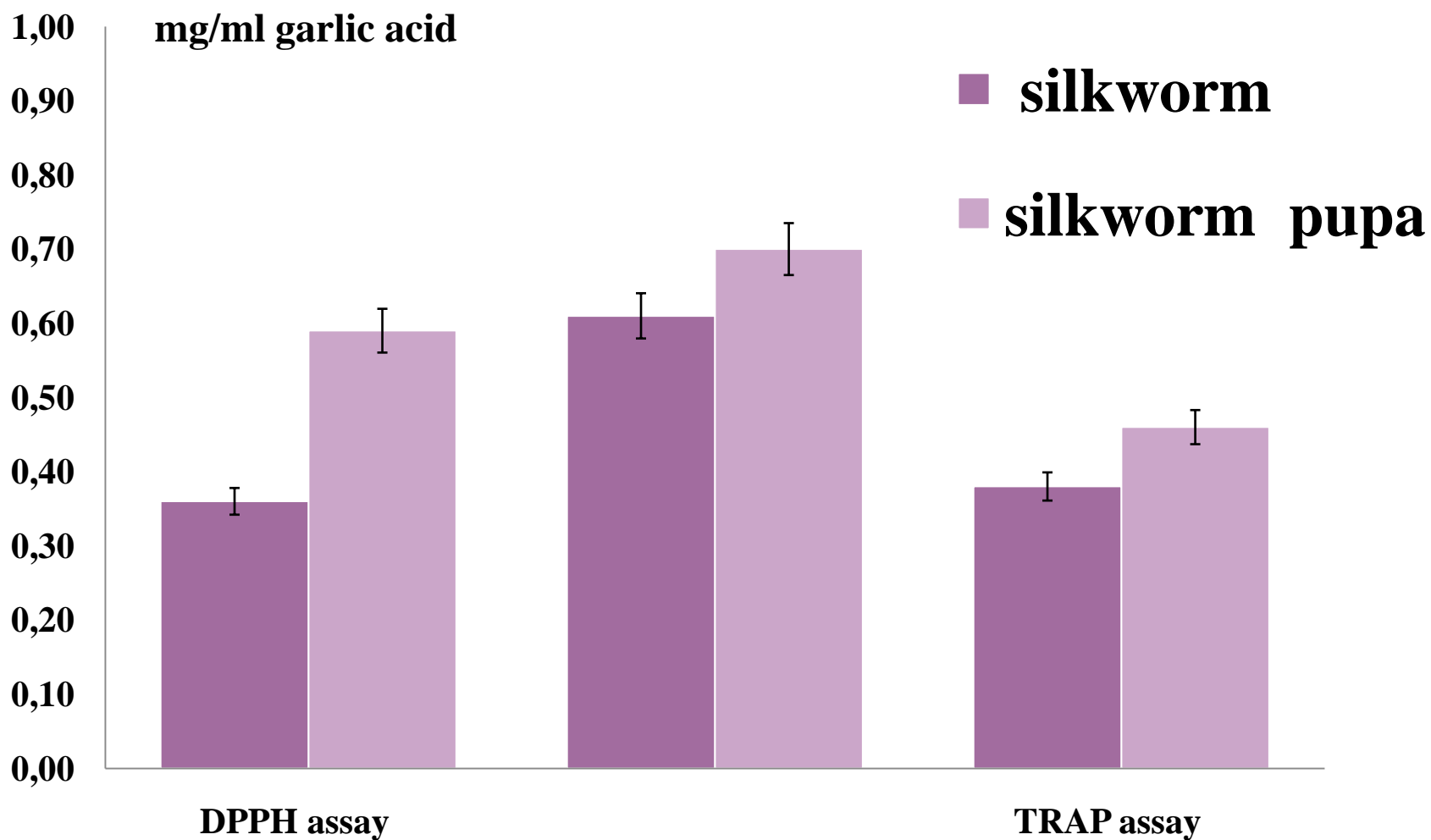
■ Luangsurin

■ J108 x Nanglai



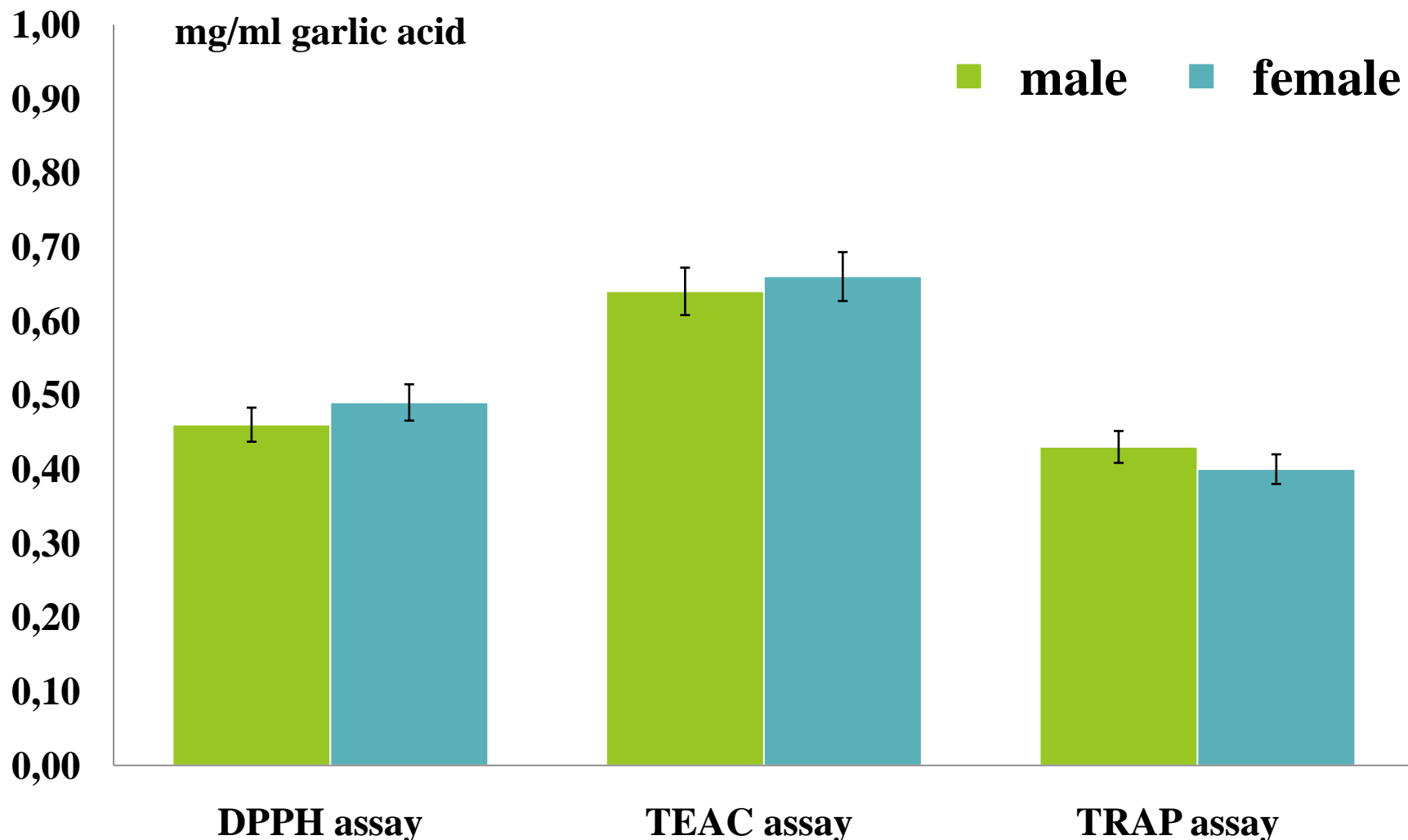


Effect of silkworm stage on their antioxidant activities





Effect of silkworm sex on their antioxidant activities





Results : antioxidant activities

- **Nangnoi Srisaket-1 and Luang Surin silk worm varieties had significantly ($p \leq 0.05$) highest of antioxidant activities.**
- **Silkworm pupa showed higher antioxidant activities than silkworm**
- **Both male and female gave the same level of antioxidant activities with having no significant differentiation.**



Conclusions

- **7 Thai silkworm varieties, 2 silkworm stages and 2 silkworm sexes had similar basic chemical compositions**
- **Silkworm pupa of Nangnoi Srisaket-1 and Luang Surin varieties had highest antioxidant activities**
- **High potential of silkworm pupa for further healthy products were both male and female of Luang Surin and Nangnoi Srisaket-1 varieties**



THANK YOU



For

Your Kind

Attention

