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IMPROVEMENT OF SILKWORM (*BOMBYX MORI* L.) HYBRIDS FOR COCOON AND EGG PRODUCTION USING HONEY-ENRICHED MULBERRY (*MORUS ALBA* L.) LEAVES

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ABSTRACT

The study aimed to determine the performance of six (6) parental F_1 silkworm hybrids fed with mulberry leaves enriched with honey concentrations. Evaluation of the different silkworm hybrids was based on cocoon and egg production parameters. Treatments were arranged in Split Plot in Randomized Complete Block Design (RCBD). Data were analyzed using Analysis of Variance (ANOVA) and comparison of treatment means were determined using Tukey's Honest Significant Difference (HSD) Test. Interaction of honey concentration and silkworm hybrids was tested using Fisher's protected Least Significant Difference (LSD). Mulberry leaves enriched with 30% honey concentration gave higher cocoon yield box^{-1} when fed to silkworm hybrids DMMMSU 201, DMMMSU 208, DMMMSU 210 and DMMMSU 215; and 45% honey concentration was best for DMMMSU 201. Hybrid DMMMSU 210 gave higher single cocoon shell weight and cocoon shell percentage with a 15% honey-enriched diet. Hybrids DMMMSU 210 gave higher hatching percentage with 15% and 30% honey enrichment while DMMMSU 201, 202 and 208 responded positively with all the treatment concentrations. The effect of honey-enriched mulberry on cocoon and egg parameters could be attributed to honey concentrations.

Keywords: *Silkworm hybrids, Honey concentrations, Egg production, Cocoon quality, Mulberry leaves*

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INTRODUCTION

In sericulture, quality silkworm egg is considered as the backbone of silk industry. There could be no good quality cocoon without good quality and disease-free silkworm eggs. Thus, silkworm rearing strategies must be employed to ensure better cocoon yield and egg viability. The silkworm, *Bombyx mori* L. feeds solely on mulberry leaves. The quality of mulberry leaves greatly affects silkworm growth and development and subsequently, cocoon production. Studies show that nearly 70 percent of silk produced by silkworms are directly linked with mulberry leaf proteins. Hence, silkworm should be fed abundantly with good quality mulberry leaves for successful cocoon production and high silk yield (Bhattacharyya *et al*., 2016 and Masthan *et al*., 2011).

One of the alternative ways to improve silkworm larval growth is enrichment of mulberry leaves with supplementary nutrients (Rajabi *et al*., 2007; Tamaselvi *et al*., 2020). The use of minerals and vitamins as food supplements for silkworms has been tried by scientists to improve silk quality and quantity (Manjula *et al*., 2011). Hiware (2006) found out that the quality and quantity of silk improved by fortifying mulberry leaves with nutrients, spraying antibiotics, juvenile plant hormone, plant products or using plant extracts. These nutrients consequently affect silkworm growth and survival rates. In a related study, mulberry leaves were supplemented with various concentrations of plant extract (*Vigna unguiculata*) that significantly increased pupal weight, silk length, and silk weight of larvae which was accounted for the high protein content of the extract (Manjula *et al*., 2011). Kamrul, *et al*. (2013) found out that oral supplementation of different concentrations of vitamin B and C to the 3rd, 4th and 5th instar larvae of multivoltine silkworm variety, resulted to significant increase in larval and pupal characters. Relatively, Pal (2003) also found that vitamin B complex significantly improved silkworm growth and development, with beneficial effects on the economic characteristics of the cocoon. Feeding of silkworm hybrids with protein-rich supplements such as pollen grains, royal jelly, amino acid and bee honey resulted to increased fresh cocoon weight, cocoon shell weight and shell/cocoon ratio. Moreover, such feeding strategy also led to shorter larval duration and decreased larval mortality percentages (Kamel *et al*., 2016).

Natural honey is a sweet, flavorful liquid produced by honey bees having high nutritional value and health benefits. It is mainly composed of sugars and water but also contains Vitamins (B and C) and minerals. Other constituents include enzymes, amino acids, antibiotic-rich inhibine, proteins, aroma compounds and polyphenol antioxidants, and micronutrients (Bogdanov *et al*., 2008 and Ajibola *et al*., 2012). With these recorded nutritional attributes of honey, the study aimed to investigate its beneficial effects on DMMMSU silkworm hybrids, using various honey concentrations as nutritional enrichment to mulberry leaves. Further, the study also determined the best honey concentration as a potential nutrient supplement to improve silkworm egg and cocoon characteristics of the six (6) promising DMMMSU silkworm parental hybrids, which were evaluated in terms of egg productivity and cocoon yield and quality. The need to improve silkworm hybrid egg and cocoon parameters was seen to be of utmost importance, particularly for the benefit of sericulture farmers. Increasing cocoon and silk production means augmenting the local demand for silk fabric in the country.

MATERIALS AND METHODS

Three (3) honey concentrations (15%, 30% and 45%) were formulated and tested on six (6) DMMMSU Silkworm Hybrids. Plain mulberry leaves (0%-No honey) served as control.

The treatment combinations were the Honey Concentrations (Main Treatment) and Parental Hybrids (Sub-treatment). The various honey concentrations were: C1 - 0% (no honey), C2 - 15% honey, C3 - 30% honey, and C4 - 45% honey. On the other hand, the parental silkworm hybrids were: H1 (DMMMSU 201), H2 (DMMMSU 202), H3 (DMMMSU 210), H4 (DMMMSU 215), H5 (DMMMSU 225), and H6 (DMMMSU 208).

Silkworm rearing and treatment administration: Twelve (12) days before the scheduled rearing, three (3) disease-free layings per silkworm hybrid were incubated, following the standard operating procedures. When 90% of the eggs hatched, the silkworm larvae were reared at DMMMSU-Sericulture Research and Development Institute, Experimental Station, employing the standard rearing procedures.

The honey concentrations were prepared as follows: 15% = 15 ml honey + 85 ml distilled water; 30% = 30 ml honey + 70 ml distilled water; and 45% = 45 ml honey + 55 ml distilled water, with each solution making up 100 ml. Control leaves (0%-No honey) were sprayed with distilled water alone. From third to fifth larval instars, the silkworm larvae were fed 4x daily with mulberry leaves sprayed with the various honey solutions (15%, 30% and 45%). The treatments were arranged in a Randomized Complete Block Design (RCBD) in Split Plot with 3 replications.

Data Collection on Cocoon Yield and Egg production Parameters: On the sixth day after mounting, the cocoons were harvested. Data on cocoon parameters were gathered and recorded, including the total weight of cocoons harvested (actual yield), cocoon yield box^{-1} (CYB^{-1}), single cocoon weight (SCW), single cocoon shell weight (SCSW), cocoon shell percentage (CSP), effective rearing rate (ERR), and pupation rate (PR).

The CYB^{-1} is the total weight of cocoons for unit number of larvae retained after the second molt, expressed in kilogram. It was computed based on the total weight of harvested cocoons divided by the number of silkworms at 3rd instar multiplied by 20,000/1000 grams, which are constant. For SCW, ten (10) cocoons were randomly selected and weighed, then the average weight was calculated. For SCSW, previously weighed cocoons were cut and pupae were removed. The empty shells were weighed, then the average was obtained.

Meanwhile, CSP is the average ratio of 10 cocoon shells to the total cocoon weight, assessed in percentage. It was calculated based on the weight of cocoon shell divided by the weight of cocoon multiplied by 100%. ERR is the number of cocoons produced out of the number of larvae retained at the third instar, expressed in percentage. It was estimated based on the total number of cocoons harvested divided by the number of silkworms reared multiplied by 100%. PR was computed by dividing the number of pupae over the number of sample cocoons multiplied by 100%.

Cocoons that passed the standard average cocoon weight, shell weight, and cocoon shell percentage, uniform shape, size, and wrinkles per treatment/block were selected and preserved for further assessment of egg production parameters such as fecundity (F), referred to as the total number of eggs per laying; and hatching percentage (HP), computed based on the total number of eggs hatched over the total number of eggs per laying multiplied by 100%.

The data gathered were recorded, tabulated, computed and statistically analyzed using the Analysis of Variance (ANOVA) for Randomized Complete Block Design (RCBD) in Split Plot. Significant results were further tested using Tukey's Honest Significant Difference (HSD). Interaction effects were analyzed using the Fisher's Least Significant Difference Test.

RESULTS AND DISCUSSION

Performance of DMMMSU silkworm hybrids administered with various honey concentrations based on cocoon parameters: *Cocoon yield box^{-1} (CYB)*: The different honey concentrations influenced CYB of the six silkworm hybrids. Highest CYB was registered in silkworm hybrids fed with mulberry leaves alone with 18.64 kg but comparable with 30% and 45% honey concentrations with 17.15 and 17.39 kg, respectively (Table 1). The lowest CYB was recorded in silkworms fed with mulberry leaves enriched with 15% honey concentration.

Table 1. Performance of honey concentration, parental hybrids, and their interaction effect on cocoon yield box^{-1}

Hybrid/ Concentration	DMMMSU 201	DMMMSU 202	DMMMSU 208	DMMMSU 210	DMMMSU 215	DMMMSU 225	Mean [2]
0% No honey	13.06 ^{k}	20.51 ^{abc}	18.62 $^{c-f}$	16.86 $^{e-i}$	21.18 ^{ab}	21.59 ^{a}	18.64 ^{a}
15% Honey	15.29 $^{h-k}$	16.36 $^{f-i}$	18.03 $^{d-g}$	17.55 $^{e-h}$	14.64 ^{ijk}	15.31 $^{h-k}$	16.20 ^{b}
30% honey	18.87 $^{b-e}$	15.77 $^{g-j}$	17.27 $^{e-h}$	16.24 $^{f-i}$	19.21 $^{a-e}$	15.55 ^{hij}	17.15 ^{ab}
45% Honey	20.38 $^{a-d}$	16.97 $^{e-i}$	18.65 $^{c-f}$	18.88 $^{b-e}$	15.68 $^{g-j}$	13.78 ^{jk}	17.39 ^{ab}

[1]Interaction effect means are significantly different at .05% level (LSD).
[2]Concentration means are significantly different at .05% level (HSD).

On the interaction effect of the honey concentration and silkworm hybrids, feeding of mulberry leaves without honey concentration to silkworm hybrid DMMMSU 225 significantly produced the highest CYB^{-1} (21.59 kg) and comparable to DMMMSU 215 (21.18 kg), DMMMSU 202 (20.51 kg) and DMMMSU 208 (18.62 kg), which were also fed with mulberry leaves alone. Notably, however, 45% honey concentration when fed to DMMMSU 201 comparably gave high CYB^{-1} (20.38 kg). Likewise, 30% honey concentration when fed to hybrids DMMMSU 215, DMMMSU 210, DMMMSU 201, and DMMMSU 208 produced comparable results with 19.21 kg, 18.88 kg, 18.87 kg and 18.65 kg, respectively. These indicate that mulberry leaves with 30% and 45% honey concentrations can be fed to silkworm parental hybrids to produce equally high CYB^{-1} compared to the non-honey treated hybrids. Higher concentration of honey starting from 30% is needed to obtain comparatively high CYB^{-1}.

Single Cocoon Weight (SCW): Significant differences were seen among the various honey concentrations and silkworm hybrids tested on SCW (Table 2). Feeding silkworm hybrids with plain mulberry leaves (0% honey) yielded the highest SCW with a mean of 1.46 g. The lowest SCW was produced using 45% honey concentration with SCW of 1.302 g. DMMMSU 201 produced the highest SCW with 1.933 g while hybrid DMMMSU 225 yielded the lowest SCW with 1.30 g, comparable to DMMMSU 215 (1.308 g) and DMMMSU 210 (1.324 g).

Table 2. Performance of honey concentration, parental hybrids, and their interaction effect on single cocoon weight

Hybrid/ Concentration	DMMMSU 201	DMMMSU 202	DMMMSU 208	DMMMSU 210	DMMMSU 215	DMMMSU 225	Mean [2]
0% No honey	1.933 ^{a}	1.393 ^{cd}	1.420 ^{bc}	1.290 ^{mn}	1.383 ^{cde}	1.340 $^{f-l}$	1.460 ^{a}
15% honey	1.463 ^{b}	1.317 $^{g-n}$	1.353 $^{d-h}$	1.300 $^{k-n}$	1.383 ^{cdef}	1.347 $^{d-j}$	1.361 ^{b}
30% honey	1.307 $^{h-n}$	1.283 ^{n}	1.350 $^{d-i}$	1.327 $^{g-m}$	1.343 $^{e-k}$	1.293 ^{lmn}	1.317 ^{bc}
45% honey	1.357 $^{d-g}$	1.207 ^{o}	1.310 $^{h-n}$	1.317 $^{g-n}$	1.310 $^{h-n}$	1.317 $^{g-n}$	1.302 ^{c}
Mean [3]	1.515 ^{a}	1.357 ^{b}	1.355 ^{b}	1.324 ^{c}	1.308 ^{c}	1.300 ^{c}	

[1]Interaction effect means are significantly different at .05% level (LSD).
[2]Concentration means are significantly different at .05% level (HSD).
[3]Hybrid means are significantly different at .05% level (HSD).

On the interaction effects between honey concentration and silkworm hybrids, it can be noted that feeding plain mulberry leaves to silkworm hybrid DMMMSU 201 produced the heaviest single cocoon with a mean of 1.93 g. The lightest cocoon (1.207 g) was produced using 45% honey concentration when fed to DMMMSU 202. These imply that honey supplementation did not influence single cocoon weight and feeding silkworms with mulberry leaves alone can produce heavy cocoons.

Single Cocoon Shell Weight (SCSW): Based on cocoon shell weight results (Table 3), 0% honey produced the heaviest cocoon shell of 0.246 g but comparable to 15% (0.245 g) and 45% honey concentrations (0.229 g). On the silkworm hybrids used, DMMMSU 225 significantly produced the highest SCSW (0.251 g), comparable to DMMMSU 210 with 0.246 g. On the other hand, the lightest shell was observed from DMMMSU 201 (0.228g) and DMMMSU 202 (0.230g).

On the interaction effects of honey concentration and parental hybrids, mulberry leaves enriched with 15% honey concentration significantly produced the heaviest cocoon shell (0.31g) when fed to hybrid DMMMSU 210. The lightest cocoon shell (0.21g) was observed from 45% honey concentration when fed to hybrid DMMMSU 210. Results revealed that honey-enriched mulberry leaves significantly affect the single cocoon shell weight of the parental hybrids used, where 15% honey concentration can induce heavier cocoon shell when fed to DMMMSU 210. However, the same hybrid can also produce cocoons with the lowest shell weight when fed with 45% honey concentration.

Table 3. Performance of parental hybrids, honey concentration and its interaction effect on single cocoon shell weight.

Hybrid/ Concentration	DMMMSU 201	DMMMSU 202	DMMMSU 208	DMMMSU 210	DMMMSU 215	DMMMSU 225	Mean ²
0% No honey	0.217 ^{ghi}	0.243 $^{c-f}$	0.257 ^{c}	0.250 ^{cd}	0.250 ^{cd}	0.257 ^{c}	0.246 ^{a}
15% honey	0.247 ^{cde}	0.227 $^{e-i}$	0.240 $^{c-f}$	0.310 ^{a}	0.217 ^{ghi}	0.230 $^{d-h}$	0.245 ^{a}
30% honey	0.230 $^{d-h}$	0.223 $^{f-i}$	0.213 ^{ghi}	0.217 ^{ghi}	0.210 ^{hi}	0.233 $^{d-g}$	0.221^{b}
45% honey	0.217 ^{ghi}	0.227 $^{e-i}$	0.223 $^{f-i}$	0.207 ^{i}	0.217 ^{ghi}	0.283 ^{b}	0.229 ^{ab}
Mean ³	0.228 ^{c}	0.230 ^{c}	0.233 ^{bc}	0.246 ^{ab}	0.233 ^{bc}	0.251^{a}	

[1]Interaction effect means are significantly different at .05% level (LSD).
[2]Concentration means are significantly different at .05% level (HSD).
[3]Hybrid means are significantly different at .05% level (HSD).

Cocoon Shell Percentage (CSP): On cocoon shell percentage, the highest silk ratio (18.07%) was produced using 15% honey concentration but comparable with 45% and 0% with 17.57% and 17.23%, respectively. Silkworm hybrid DMMMSU 225 significantly recorded the highest CSP with 18.95% but was comparable to DMMMSU 210 (18.82%), as shown in Table 4.

Table 4. Performance of honey concentration, parental hybrids, and their interaction effect on cocoon shell percentage

Hybrid/ Concentration	DMMMSU 201	DMMMSU 202	DMMMSU 208	DMMMSU 210	DMMMSU 215	DMMMSU 225	Mean ²
0% No honey	11.21 ^{l}	17.46 $^{e-i}$	18.08 $^{c-f}$	19.38 ^{c}	18.07 $^{c-f}$	19.16 ^{cd}	17.23 ^{ab}
15% honey	16.09 $^{f-k}$	17.20 $^{e-j}$	17.74 $^{d-h}$	23.88 ^{a}	15.67 ^{jk}	17.09 $^{f-k}$	18.07 ^{a}
30% honey	17.59 $^{e-h}$	17.39 $^{e-i}$	15.81 ^{jk}	16.33 $^{h-k}$	15.64 ^{k}	18.03 $^{c-g}$	16.80 ^{b}
45% honey	15.95 ^{ijk}	18.67 ^{cde}	17.08 $^{f-k}$	15.68 ^{jk}	16.53 $^{g-k}$	21.52 ^{b}	17.57 ^{ab}
Mean ³	15.41 ^{e}	17.68 ^{bc}	17.18 ^{cd}	18.82 ^{ab}	16.48 ^{de}	18.95 ^{a}	

[1]Interaction effect means are significantly different at .05% level (LSD).
[2]Concentration means are significantly different at .05% level (HSD).
[3]Hybrid means are significantly different at .05% level (HSD).

On the interaction effects of honey concentration and parental hybrids, 15% honey concentration produced the highest CSP of 23.88% when fed to DMMMSU 210. The lowest CSP (11.21%) was recorded using plain mulberry leaves (0% honey) when fed to DMMMSU 201. This implies that honey enrichment to mulberry leaves significantly influenced the cocoon shell percentage ideally at 15% concentration using DMMMSU 210 silkworm hybrid.

***Effective Rearing Rate (ERR)*:** On the effective rearing rate, honey concentration, parental hybrids, and their interaction effects revealed no significant difference. ERRs of the silkworm hybrids were not affected whether these were fed with plain mulberry leaves or with honey concentrations (Table 5). ERRs of the different hybrids using various honey concentrations ranged from 74.67 to 94.00%.

Pupation Rate: On pupation rate, insignificant differences were observed on concentration of honey, parental hybrids, and their interaction effects (Table 6). Similarly, the different honey concentrations did not affect pupation rate of the silkworm hybrids tested, which ranged from 93.33% to 100.00%.

Performance of honey concentrations and silkworm hybrids and their interaction effect on egg parameters: Fecundity: As to fecundity, no significant differences were noted among honey concentration means, however, parental hybrid means revealed significant differences (Table 7). Silkworm hybrid DMMMSU 225 significantly produced the highest fecundity of 562.60, comparable with hybrids DMMMSU 215 (543.0), DMMMSU 210 and DMMMSU 201 (535.9).

On the interaction effects of honey concentration and parental hybrids to fecundity, feeding of plain mulberry leaves (0% honey) to silkworm hybrid DMMMSU 225 significantly produced the highest fecundity or the greatest number of eggs with a mean of 638.00. Incidentally, plain mulberry leaves also produced the lowest number of eggs with 495.3 when fed to hybrids DMMMSU 208. These results imply that more eggs can be produced by hybrid DMMMSU 225 when fed with mulberry leaves alone. However, feeding of plain mulberry leaves to DMMMSU 208 would result to lower fecundity.

Hatching Percentage (HP): On hatching percentage, treatment means of honey concentrations and parental hybrids did not vary significantly (Table 8).

Table 5. Performance of honey concentration, parental hybrids and its effect on effective rearing rate

Hybrid/ Concentration	DMMMSU 201	DMMMSU 202	DMMMSU 208	DMMMSU 210	DMMMSU 215	DMMMSU 225
0% No honey	80.667	86.667	86.667	79.333	87.333	88.000
15% Honey	75.333	83.333	86.000	84.000	74.667	80.667
30% honey	92.667	86.667	84.000	88.667	94.000	82.667
45% honey	87.333	86.000	83.333	90.000	82.667	79.333

Table 6. Performance of honey concentration, parental hybrids, and their effect on pupation rate

Hybrid/ Concentration	DMMMSU 201	DMMMSU 202	DMMMSU 208	DMMMSU 210	DMMMSU 215	DMMMSU 225
0% (No honey)	96.667	100.000	96.667	100.000	96.667	100.000
15% honey	100.000	96.667	100.000	100.000	100.000	96.667
30% honey	100.000	100.000	100.000	100.000	100.000	100.000
45% honey	100.000	96.667	96.667	96.667	100.000	93.333

On the interaction effects of honey concentration and parental hybrids, DMMMSU 210 gave the highest hatching percentage (96.98%) when fed with non-honey enriched leaves, and comparable to those administered with 15% and 30% honey, but had lower HP with 45% honey enrichment. Moreover, DMMMSU 201, 202 and 208 also obtained comparably high HP with all the different treatments given. On the other hand, lower HPs were noted in DMMMSU 210 and 225 when fed with plain mulberry leaves. These imply that silkworm hybrids, DMMMSU 215, 201, 202 and 208 can produce eggs with high HPs when fed with or without honey enrichment. However, DMMMSU 210 and 225 can be fed with honey-enriched mulberry leaves to obtain higher HP.

Table 7. Performance of honey concentration, parental hybrids and their interaction effect on fecundity

Hybrid/ Concentration	DMMMSU 201	DMMMSU 202	DMMMSU 208	DMMMSU 210	DMMMSU 215	DMMMSU 225
0% No honey	542.7 ^{bc}	514.7 ^{bcd}	495.3 ^{d}	554.7 ^{b}	520.7 ^{bcd}	638.0 ^{a}
15% honey	540.3 ^{bc}	519.3^{bcd}	506.7 ^{cd}	524.0 ^{bcd}	547.0 ^{bc}	543.0 ^{bc}
30% honey	543.7 ^{bc}	539.3 ^{bcd}	549.7 ^{bc}	540.3 ^{bc}	546.3 ^{bc}	542.3 ^{bc}
45% honey	517.0 ^{bcd}	531.7 ^{bcd}	552.0 ^{b}	541.7 ^{bc}	558.0 ^{b}	527.0 ^{bcd}
Mean [3]	535.9 ^{ab}	526.2 ^{b}	525.9 ^{b}	540.2 ^{ab}	543.0 ^{ab}	562.6 ^{a}

[1]Interaction effect means are significantly different at .05% level (LSD).
[2] Concentration means are significantly different at .05% level (HSD).
[3] Hybrid means are significantly different at .05% level (HSD).

Table 8. Performance of honey concentration, parental hybrids and its interaction effect on hatching percentage

Hybrid/ Concentration	DMMMSU 201	DMMMSU 202	DMMMSU 208	DMMMSU 210	DMMMSU 215	DMMMSU 225	Mean[2]
0% No honey	92.48 ^{abc}	92.15 ^{abc}	83.88 $^{c-f}$	96.98 ^{a}	81.99 ^{df}	95.26 ^{ab}	90.46
15% honey	92.14 ^{abc}	93.91 ^{ab}	94.79 ^{ab}	90.34 $^{a-f}$	91.13 ^{abc}	92.10 ^{abc}	92.4
30% honey	92.61 $^{a-e}$	91.43 ^{abc}	89.95 $^{a-f}$	88.71 $^{a-f}$	90.63 $^{a-d}$	89.69 $^{a-f}$	90.17
45% honey	94.20 ^{ab}	92.86 ^{ab}	90.72 ^{abc}	87.49 $^{b-f}$	93.54 ^{ab}	89.29 $^{a-f}$	91.35
Mean[3]	92.36	92.59	89.83	90.88	89.32	91.58	

[1]Interaction effect means are significantly different at 0.05% level (LSD).
[2] Concentration means are significantly different at .05% level (HSD).
[3] Hybrid means are significantly different at .05% level (HSD).

DISCUSSION

The use of artificial diets to enrich mulberry leaves with the aim of increasing cocoon production is considered an important aspect of sericulture (Alessio *et al*., 2014), as cited by Thangapandiyan and Dharanipriya, 2019. The effects of honey and its allied products on silkworm (*Bombyx mori* L.) have been extensively studied to improve larval growth and silk productivity where honey was found to increase weights of matured larvae, pupae, fresh cocoons and cocoon shells (Gad, 2013). Sivaprasad and Thulasi (2014) also validated that honey played a vital role in silkworm growth and metabolism and its impact seemed to be concentration-dependent and tissue-specific.

At DMMMSU-Sericulture and Development Institute, traditional rearing of silkworms on mulberry leaf alone has been practiced and seemed insufficient to achieve increased cocoon and silk production. The present study investigated the influence of various concentrations of honey (15%, 30% and 45%) on silkworm cocoon and egg parameters. Six silkworm hybrids were fed with plain and honey-enriched mulberry leaves from third to fifth instars. Based on the results, the varying honey concentrations significantly influenced parameters such as CYB^{-1}, SCSW, CSP and HP. On CYB^{-1}, it was noted that 30% honey concentration was best for silkworm hybrids DMMMSU 201, DMMMSU 208, DMMMSU 210 and DMMMSU 215; and 45% honey enrichment was suited for DMMMSU 201. In terms of SCSW and CSP, 15% honey enrichment was best for DMMMSU 210. For HP, 15% and 30% honey enrichment were found suited for DMMMSU 210 while all of the honey concentrations were seen good for DMMMSU 201, 202 and 208. These further indicate that each concentration gave varied effects on the silkworm hybrids used. Overall, silkworm hybrid DMMMSU 210 responded positively to 15% and 30% honey concentrations with comparable increase in CYB^{-1}, SCSW, CSP and HP. The findings conform with the results of Bhatti *et al*. (2019) that honey-treated mulberry leaves positively affect larval growth and cocoon yield. It was also found that cocoon formation started earlier for honey-treated larvae than the untreated group. This may account for the higher SCSW and CSP obtained in the present study. Moreover, since honey-enrichment enhanced larval growth, which consequently restored fecundity and pupation rate, these may account for the higher HP of the eggs produced. Overall, a concentration-based honey enrichment can be used for specific silkworm hybrids to improve some cocoon and egg parameters.

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