"USING OF SOME PLANT EXTRACTS AND HONEYBEE PRODUCTS FOR FEEDING OF IMPORTED AND LOCAL HYBRIDS OF MULBERRY SILKWORM (Bombyx mori L.)"

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ABSTRACT

Nine aqueous or alcoholic plant extracts and three hive products were offered to 4th and 5th instar of imported and local hybrids of silkworm. They were: aqueous and alcoholic extracts of Eucalyptus. Mulberry, Christ’s thorn (Hozaen and Baladi), Psidium, Ocimum basilicum, Mint, Buddia asiatica, Lantana camara, and Pollen, Bee Bread, Propolis. The measured or calculated parameters were: initial, final, average larval weight (g) and growth index, silk glands weight and ratio %, weight of cocoons, cocoon’s shell and pupae, and cocoon shell ratio %.

Concerning imported race of silkworm, feeding with mulberry leaves treated with aqueous extracts leads to significant increment of cocoon shell weight (g) in Eucalyptus, Christ’s thorn (Baladi), O. basilicum, mint, pollen and propolis. Insignificant increase in cocoon shell ratio % was noticed in Eucalyptus, Psidium, mint and propolis, while in case of alcoholic extracts, maximum significant shell weight was detected in Christ’s thorn (Baladi) treatment, followed by: Eucalyptus, mulberry, Christ’s thorn (Hozaen), Psidium, O. basilicum and mint, with significant differences with control. Insignificant increment in cocoon shell ratio % was noticed in Psidium treatment only. All differences in treatments of imported race were significant with both of aqueous or alcoholic extracts, except cocoon shell ratio %.

Concerning local race of silkworm, feeding with mulberry leaves which treated with tested aqueous extracts leads to significant increase in cocoon shell weight (gm) in Eucalyptus, mulberry, Christ’s thorn (Hozaen), B. asiatica, L. camara, and pollen treatments, and insignificant increase in Christ’s thorn (Baladi), Psidium, O. basilicum, and mint treatments. General increase in cocoon shell ratio % in all treatments except bee bread and significant differences were detected in Eucalyptus and propolis treatments, while in case of alcoholic extracts significant increase in cocoon shell weight (gm) was found in B. asiatica treatment, followed by: eucalyptus, mulberry, Christ’s thorn (Hozaen), L. camara, pollen and propolis treatments. Insignificant increment in cocoon shell ratio % in propolis, L. camara, B. asiatica, mint and Eucalyptus. For local hybrid of silkworm, no significant differences in alcoholic treatments, were observed, however insignificant increment differences were detected in five treatments. Aqueous extracts of Eucalyptus or propolis increased cocoon shell ratio % in both of tested hybrids. Aqueous or alcoholic extracts of B. asiatica or L. camara increased cocoon shell ratio % in local hybrid. Aqueous extracts increased cocoon shell ratio % in 15 cases, while in case of alcoholic extracts in 6 cases only.

The most effective treatments were: Eucalyptus, Psidium and propolis. Using of aqueous extracts was more effective available, and cheap as compared with using alcohol in extraction.

INTRODUCTION

The silkworms consume mulberry leaves in large quantities. It was the scope of many researchers was observing their reaction to addition of various extracts for their food.

Rajeswari and Isaiarasu (2004) supplementation of Moringa olifera elicits varied responses in silkworm, Sridevi et al. (2004) used extracts of some medicinal plants, Terminalia arjuna, Withania somnifera, Tinospora cordifolia, and Leptadenia reticulata and found that all biological and economical parameters of silkworm were higher values compared with control. Murugesh and Baskar (2008) studied the effect of aqueous extracts of some plants on increasing of silk productivity of silkworm. Manjula et al. (2010) suggest that the administration of Dolichos lablab with mulberry leaves at 7.5% concentration was enhanced the biochemical reaction involved in the silk production.

Zah et al. (2001) reported that the olive oil is detrimental to the development of silkworm, regardless of the method of administration. Chandrakala et al. (2012) tested Parthenium hysterophorus extracts on young silkworm and concluded that utilizing of this extraction silkworm rearing is of special merits. Shahin et al. (2013) reported that lettuce seed oil, as a food additive, enhanced the productivity of silkworm. Karthikairaj et al. (2014) proved that herbal aqueous and alcoholic extracts of Ocimum, Acalypha, and Leucas can be exploited to control of microbial pathogens at the time of silkworm rearing and to get improved silk yield. Pardeshi and Bajad (2014a,b) used Amaranthus hybridus and Xanthium indicum extracts to improve the economic parameters of silkworm (Bombyx mori).

Aqueous leaf extract of Ocimum sanctum was tested by Sujatha et al. (2015). The same plant species was also tested by Padma et al. (2015) in India. Rateb and Abdel-Rahman (2015) tested some extracts including plant extracts on biological and economical parameters of silkworm.

This work aimed to study the effect of alcoholic and aqueous extracts of nine plant species and three honeybee hive products on the biological and economical characters of the silkworm (B. mori).

MATERIALS AND METHODS

This work was conducted in the Laboratory of Silkworm Rearing, Plant Protection Department, Faculty of Agriculture, Assiut University, during 2015.

Local and Bulgarian hybrid of silkworm were supplied from Sericulture Division, Plant Protection Institute, Ministry of Agriculture, Giza, to be used in the experimental work.

1- Rearing of silkworm:
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The temperature during the incubation of silkworm eggs, was ranged from 23 to 25°C, while the relative humidity was ranged from 85 to 90%. Complete hatching took place, after few days of incubation. New leaves, or tender strips of mulberry leaves, were put over the hatching larvae, which crawled up the leaves, then these were removed with silkworms to the rearing place.

Normal method of silkworm rearing was carried out, till the beginning of 4th instar, or beginning of tested treatments. The mulberry leaves for feeding of silkworm were cut early morning, then covered with wet clothes to protect than from loss of water. The leaves were cleaned and given to the first and second larval instars as strips or buds. Afterwards, the whole leaves was distributed in a usual manner four times/day, till the beginning of fourth instar. Regular cleaning of rearing beds were carried out.

II- Treatments:

Nine alcoholic or aqueous plant extracts and three honeybee colony products were tested during this work. They were: Eucalyptus, Mulberry, Christ's thorn (Hozaen and Baladi), Psidium, Ocimum basilicum, Mint, Buddlia asiatica, Lantana camara, and hive products: Pollen, Bee Bread and propolis. These extracts were sprayed on mulberry leaves and used for feeding of 4th and 5th instars larvae of imported and local hybrids silkworm (Bombyx mori).

For preparing of alcoholic or aqueous plant extracts: The dried leaves were extracted using 70% ethyl alcohol or dish water in a rate of 10 gms/100 ml alcohol, in a water bath at 45°C for 48 hrs. Then filtered and the filtrated was completed to 100 ml using alcohol 70%.

All these treatments were used at concentration of 1% with water.

Every tested treatment was replicated three times in three carton boxes (20.5 x 19.5 x 6.5 cm), each contain fifty silkworms larvae and 150 larvae/treatment. Feeding with treated leaves was conducted four times/day. Control larvae were fed with untreated mulberry leaves. Twelve treatments were used during the work in addition to control.

III- Criteria for evaluation:

1- Fresh weight of silkworms larvae:

Twenty larvae were weighed had initial and final weight, average weight and growth index were calculated 60 from each replicate were weighed (in gms), larvae/ treatment. Control larvae were also weighed. Total and mean weight/larvae (gm.) was calculated.

2- Fresh weight of silk glands:

Fifteen nine days old 5th instar larvae, from each treatment were used for determination of silk glands weight (in gms). Control silk glands were also weighed (in gms). Total and mean weight (in gms) were calculated and ratio of glands weight body weight was calculated.

3- Fresh weight of cocoons:

From each replicate and treatments, good cocoons were collected, cut, opened, and pupae were weighed. The whole cocoon was weighed (in gms). Total and mean weight/cocoon (in gms), were calculated.

4- Pupal weight:

From each replicate and treatment, pupae were weighed (in gms). Total and mean weight/pupa (in gms) were estimated.

5- Cocoon shell weight (C.S.W.):

The previous cocoons were carefully opened and pupae were removed and cleaned from excuviae, then weighed. Total and mean weight/shell (in gms) were calculated.

6- Cocoon shell ratio (%)(C.S.R.%):

Cocoon shell ratio for each treatment was calculated as follows:

\[ \text{Cocoon shell ratio} \% = \frac{\text{Weight of cocoon shell}}{\text{Weight of cocoon}} \times 100 \]

Total and mean weight/shell (in gms.) were calculated.

7- Growth Index:

Twenty five 5th instar larvae of one, three, five and seven day old were weighed (in gms) and the following formula was used for calculation of the Growth Index:

\[ \text{Growth Index} = \frac{\text{Final weight of 5th instar} - \text{Initial 5th instar larval weight}}{\text{Initial larval weight of 5th instar (gms)}} \]

VI- Statistical analysis:

Obtained data were analysed using the factorial design, F-test was estimated for each analysis. The means were compared according to Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

I- Effects of used aqueous and alcoholic extracts on imported hybrid of silkworm summarized in Tables 1 and 2, respectively.

Table 1 show the effect of tested aqueous extracts on some growth parameters of silkworm. Maximum initial weight (gm) was detected in B. asiatica treatment, while maximum final weight (gm) and growth index of 5th instar larvae was found in Christ's thorn treatment. Maximum and highly significant silk gland weight (gm) in Christ's thorn (Hozaen) treatment. General significant increment in average larval weight (gm) was noticed in all used treatments except in case of Psidium, L. camara, B. asiatica and bee bread, where this increment was insignificant.

Silk gland/larval weight ratio % was generally decreased, except in mint treatment. Significant increase in fresh cocoon weight (gm) in Eucalyptus, and Christ's thorn treatments, while this increment was nonsignificant in mulberry, Psidium, O. basilicum, mint, L. camara and pollen treatments. Highly significant increase in pupal weight (gm) was measured in Christ's thorn (Baladi) treatment, only.

Significant increase in (C.S.W) in Eucalyptus, Christ's thorn (Baladi), mint, O. basilicum, pollen and propolis treatments. Insignificant increase in (C.S.R.%) was detected in Eucalyptus, Psidium, mint, and propolis treatment.
Effect of used alcoholic extracts on imported hybrid of silkworm is summarized in Table 2. Highest initial larval weight (g) was detected in pollen treatment, while maximum final weight (gm) was found in *Eucalyptus* treatment, followed by: mulberry, Christ’s thorn, *Psidium*, *O. basilicum*, and mint, and bee bread treatments. Maximum larval growth index was found in mulberry treatment, followed by *Eucalyptus*, Christ’s thorn, *Psidium* and *O. basilicum*, without significant differences.

Maximum significant increase in silk gland weight (gm) was detected in Christ’s thorn (Baladi) treatment, followed with insignificant increase in *Eucalyptus*, mulberry, Christ’s thorn (Hoazen), mint and *O. basilicum* trials. General significant increase in average larval weight (gm) except in *B. asiatica*, *L. camara*, bee bread and pollen treatments. General and significant decrease in silk gland ratio was calculated in Christ’s thorn, *O. basilicum*, mint and pollen treatments.

Significant increment in fresh cocoon weight (gm) in *Eucalyptus*, mulberry Christ’s thorn, mint and pollen trials, while maximum weight was in Christ’s thorn (Baladi) treatment. Maximum and significant pupal weight (gm) was in the last treatment, followed significantly by Christ’s thorn (Hoazen), mulberry, mint, and pollen. Maximum significant figure of (C.S.R.W.) was measured in Christ’s thorn (Bladi), followed by *Eucalyptus*, mulberry, Christ’s thorn (Hoazen), *Psidium*, *O. basilicum*, and pollen treatments. Insignificant increase in (C.S.R.%) was noticed in *Psidium* treatment.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Initial larval weight (g)</th>
<th>Final larval weight (g)</th>
<th>Growth index</th>
<th>Average larval weight (g)</th>
<th>Silk gland weight ratio (%)</th>
<th>Cocoon shell weight (g)</th>
<th>Cocoon shell ratio %</th>
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<tbody>
<tr>
<td>Treatments</td>
<td></td>
<td></td>
<td></td>
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<td>1- Eucalyptus</td>
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<td>0.8096</td>
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<td>F</td>
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<td>12- Propolis</td>
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<td>0.7616</td>
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Table 1: Effect of feeding imported silkworm on treated mulberry leaves with aqueous extracts.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Initial larval weight (g)</th>
<th>Final larval weight (g)</th>
<th>Growth index</th>
<th>Average larval weight (g)</th>
<th>Silk gland weight ratio (%)</th>
<th>Cocoon shell weight (g)</th>
<th>Cocoon shell ratio %</th>
</tr>
</thead>
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<tr>
<td>Treatments</td>
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<td>Control</td>
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<td>0.7947</td>
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</table>

Table 2: Effect of feeding imported silkworm on treated mulberry leaves with alcoholic extracts.

Thus it is possible to say that, in imported hybrid of silkworm all differences between tested treatments
were highly significant in case of aqueous or alcoholic extracts, except in (C.S.R.%), where it was insignificant with both of aqueous or alcoholic extracts.

Effect of plant extracts was studied in India by Jeyapaull et al. (2003). Orwaran and Savarkodiynie (2004) used 1% aqueous extract tapioca flour and Amaranthus leaves for feeding of silkworms.

II- Effects of used aqueous and alcoholic extracts on local hybrid of silkworm summarized in Tables 3 and 4, respectively.

Effect of examined aqueous extracts on local hybrid of silkworm is summarized in Table 3. Maximum initial larval weight (gm) was found in O. basilicum treatment. General increase in silk gland weight (gm), except with bee bread was detected. It was significant in Christ's thorn, Psidium, mint and L. camara. A general increase in silk gland ratio was detected. It was significant in Psidium, followed by: Eucalyptus, Christ's thorn, O. basilicum, mint, L. camara, and pollen treatments.

Incremental increase in cocoon fresh weight (gm) was found in Eucalyptus, mulberry, Christ's thorn, L. camara, bee bread and maximum figure was noted in pollen treatment. Significant increase in pupal weight (g) was measured in: mulberry, followed by: Christ's thorn, B. asiatica, L. camara, pollen and bee bread treatments.

General increase in (C.S.W) in all treatments, except bee bread. It was significant in: Eucalyptus, mulberry, Christ's thorn (Hozaen), P. asiatica, L. camara, and pollen treatments. A general increment in (C.S.R.%) was noticed in all examined aqueous extracts, except in bee bread treatments. This increment was significant in Eucalyptus and propolis trials.

Rajeswari and Isaiarasu (2004) found that extracts of Moringa oleifera (1% w/v) elicited a responses in the final instar larvae. The same was noticed in our work.

Hiwale and Bhalerao (2008) used aqueous extracts of two medicinal plants and found interesting and pesticide results with respect to many parameters. Effect of used alcoholic extracts on local hybrid of silkworm are summarized in Table 4. Maximum initial weight (gm) was found in O. basilicum treatment.
Maximum and significant increase in mean larval weight was detected in *B. asiatica* treatment, followed by insignificant increase in mulberry, Christ’s thorn (Baladi) and mint. General increment in silk gland ratio was noticed. It was significant in *Eucalyptus*, Christ’s thorn (Hozaen), *Psidium*, *B. asiatica*, *L. camara* and propolis.

Concerning fresh cocoon weight (g): significant increase was found in *B. asiatica*, followed by mulberry, Christ’s thorn, *A. basilicum*, pollen, *L. camara*, and propolis.

Significant increase in pupal weight (g/m) was noticed in treatments Christ’s thorn (Hozaen), *O. basilicum*, *B. asiatica*, *L. camara*, pollen and bee bread. Significant increment in (C.S.W.) was noticed in *B. asiatica*, followed by: *eucalyptus*, mulberry, Christ’s thorn (Hozaen), *L. camara*, pollen and propolis. Insignificant increment, was noticed in (C.S.R.%), when alcoholic extracts of propolis, *L. camara*, *B. asiatica*, mint and *Eucalyptus*, were used.

Concerning feeding local hybrid of silkworm, on mulberry leaves which sprayed with alcoholic extracts, insignificant increment in (C.S.R.% ) in five treatments.

From the above mentioned results, it can be concluded that aqueous extracts of *Eucalyptus* and propolis leads to increment in (C.S.R.%), in both of imported or local hybrids of silkworm. Aqueous or alcoholic extracts, increased (C.S.R.% ) in local hybrid. Aqueous extracts increase (C.S.R.% ) in 15 cases, while with alcoholic extracts it was detected in 6 cases only. This reflects the merits of using water extraction, and in the same time it is more cheap and available, as compared with using alcoholic extraction.

The best and more effective treatments during this work were: *Eucalyptus, Psidium*, and propolis.

**REFERENCES**


استخدام بعض المستخلصات النباتية ومنتجات طائفة النحل الهجين المستورد والمحلية

لا يعرف الإنسان العصبي 

1- قسم وقاية النبات، كلية الزراعة، جامعة جنوب الوادي
2- قسم وقاية النبات، كلية الزراعة، جامعة أسوان

تمت تغذية برغقات الفقار العصبي، والعصبي من نحل دودة الفراق المستورد والمحلية على 9 مستخلصات نباتية مانية أو كحولية وعلى 3 من

منظمات طائفة النحل العصبي، وذلك كما نقصت كافور، نقص نضج، نقص (ذكر)، حواف، ريحان، بنان، نشا، انحلال بالإضافة إلى حروف التمايز،

في النوع البذاري وتزامن مع بذور التفاح، وزيادة في 5%، وزن الشراذ الطازجة والصادي وعلف النشاط الفوني في النشاط الفوني، ونسبة النشاط الفوني،

أدى استخدام المستخلصات المانية على

النسل المستورد إلى تزايد محتوى العناصر في زمن علاج النشاط الفوني (مجم) في مستلزمات: كافور، نقص، نقص وبروبوليسي، ووجبت زائدة غير

معنوية في علاج النشاط الفوني 2% وكافور، حواف، نقص، البروبوليسي، بينما بالنسبة للمستخلصات الكحولية كانت على زيادة في زمن علاج

الرشاقة في مستلزمات النحل البذي، ونسبة: كافور، نقص (ذكر)، حواف، ريحان، ناش، النشاط في نمط للعناء من المنعومي. ووجبت زائدة غير

معنوية في علاج النشاط الفوني 2% في مستلزمات الجوافة، فقط. كانت كل الفروق معنوية بين المستلزمات سواء بالنسبة للمستخلصات المانية أو الكحولية

وكذلك فيما عدا علاج النشاط الفوني 2%.

عند تغذية السلالة المحلية لدودة الفراق على أوراق توت مرشوش بالمستخلصات المانية المستخدمة ظهرت فروق معنوية في زمن علاج

الرشاقة (مجم) في مستلزمات: كافور، نقص، نقص، نشاط، ووجبت التوازي، وكانت الزيادات غير معنوية في مستلزمات: نقص (ذكر)، حواف،

ريحان، ناش، ووجبت زائدة في مستلزمات علاج النشاط الفوني 2%، فيما عدا معدلات علاج النشاط الفوني ووجبت الأنزيمات في مستلزمات الكافور

والبروبوليسي، بينما بالنسبة للمستخلصات الكحولية كانت الزيادات معنوية في زمن علاج النشاط الفوني (مجم) في مستلزمات البذاري، ونسبة: كافور، نقص (ذكر)، حواف، نشاط، نشاط وبروبوليسي. ووجبت زائدة في علاج النشاط الفوني 2% في مستلزمات: بروبوليسي، نشاط، نشاط، نشاط وبروبوليسي.

بالنسبة للمستخلصات المانية لدودة الفراق لم يتم رصد فروق معنوية في مستلزمات المستخلصات الكحولية وكانت الزيادات غير معنوية في حيّسه

مستلزمات. امتلك المستخلصات المانية الكافور والبروبوليسي إلى زيادة علاج النشاط الفوني 2% في كل من النحل المستورد أو المحلي. ثم استخدام

المستخلصات المانية والكحولية للذكور والإناث إلى زيادة علاج النشاط الفوني 2% في السائلة المحلية. ثم استخدام المستخلصات المانية إلى زيادة

الزيادات في مجم 5%، بينما بالنسبة للمستخلصات الكحولية كانت الزيادات في 5% حالة فقط. كانت أفضل المستلزمات في الكافور،

الجوافة، والبروبوليسي.

إن استخدام الماء في عملية الاستخلاص أخفض وأفضل كثيرًا من استخدام الكحول في هذا الشأن.