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Utilization of Grape Seed oil, Linalool and Drakshsava for Improvement of Quality Silk-Cocoons from Silk Spinning Worm, *Bombyx mori* (L)

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Abstract

The nutrition quality and health of larval instars exert influence on quality of the silk yield in sericulture. The acetone solutions of oil from Grape-Seeds (10 ml oil from Grape-Seeds dissolved in 90 ml acetone) and ten microliters of acetone solutions of 100 ppm linalool (one part of a substance per one million parts of a solution / mg per liter) were utilized in this attempt through the topical applications to the fifth stages of larvae of silk spinning worm, Bombyx mori (L) (Race: Double Hybrid). The larvae fed with leaves of mulberry treated with water solution of Drakshasav; group of larvae topically applied with acetone solutions of oil from Grape-Seeds (10 ppm) followed by feeding leaves of mulberry treated with aqueous solution of Drakshasav were also maintained. Fifth Instar Larval Life Duration (Hours) and Tissue-Somatic-Index (T.S.I.) of silk-glands in fifth instar silk spinning worms of control group, group from treated with oil from Grape-Seeds; Linalool treated group; group fed with leaves of mulberry treated with water solution of Drakshasav and group treated with oil of Grape-Seeds treated (topical) followed feeding with leaves of mulberry treated with water solution of Drakshasav were recorded 145.33 (± 13.786), 31.426; 168.73(± 13.221), 52.625; 177.46 (± 13.786), 52.728; 162.87(±14.572), 52.759 and 168.58(±18.789), 53.854 units respectively. The Cocoon-Shell-Ratio of control group, Grape-Seed-Oil treated group; Linalool treated group; group fed with leaves of mulberry treated with aqueous solution of Drakshasav and group treated with Grape-Seed-Oil treated acetone (topical) followed feeding with leaves of mulberry treated with water solution of Drakshasav were recorded 19.422; 23.970; 27.989; 28.048 and 28.378 units respectively. Denier scale of silk filament spun by fifth instar silkworms of control group, Grape-Seed-Oil treated group; Linalool treated group; group fed with leaves of mulberry treated with water solution of Drakshasav and group treated with Grape-Seed-Oil treated acetone (topical) followed feeding by leaves of mulberry treated with aqueous solution of Drakshasav were recorded 3.243; 4.706; 4.793; 4.882 and 4.948 units respectively. The range of improvements of tissue-somatic-index (TSI) of silk glands; Shell-Ratio of cocoon and Denier-scale of silk-filament through treatment was 52.625 to 53.854; 23.970 to 28.378 and 4.706 to 4.948 respectively. Efficient use of source of juvenoids like linalool, grape seed oil and drakshasav in desired solvent for treating the larvae serves to orchestrate the progress of metamorphosis.

Keywords: Grape-Seed-Oil, Linalool, Drakshasav, Tissue Somatic Index (TSI), Shell Ratio, Denier Scale of Silk.

Introduction

The significant feature of autotrophic and heterotrophic lives on earth lies in their orchestrate progression. Autotrophic plants are serving as innovative and the richest sources of nutrients for the animal lives. The heterotrophic lives (like animals) utilize the nutrients (in the form of functional food material and biochemical nutrient-compounds) and derive energy to lead successful life. In a practical sense, photosynthesis of energy rich food-molecules by autotrophs is for the purpose of their own-life[1].

Common grape vine, *Vitis vinifera* (L), is a flowering plant-species with grape fruits. The variety of grapes, process of vinification, grape-maturation, and grape-aging are the factors associated with qualities of aroma of grape-wine. Monoterpenols (volatile compounds) (examples: linalools, geraniols and nerols) are superintend for the specific floral-aroma of grape[2-5]. With reference to the grapes, terpenoid compounds exist in both free form and in the form of glycosides. Monoterpenols (volatile compounds) are released by either chemical actions or by the action of natural enzyme, beta-glycosidase. The credit of the action of natural enzyme, beta-glycosidase goes to the grapes or of yeasts and bacteria during the process of vinification[6-13]. Linalool is a colorless oil, belongs to "Acyclic Monoterpenoid". In plants, linalool is a volatile-metabolite with antimicrobial property[3,4].

Grape-Seed-Oil is a derived from the seeds of grape. Grape-Seed-Oil is the product released in winemaking process. Grape-Seed-Oil is commonly utilized as kitchen oil or edible oil. The light taste and polyunsaturated fat content are making Grape-Seed-Oil suitable for utilization in dressing salad, hollandaise (or mayonnaise) and as a base for infusion of oil, garlic and rosemary (or other herbs or spices). It is widely utilized in baking goods, pan-cakes, and equivocate (waffles). It is also used to spray on raisins (to retain flavor)[14]. The "Drakshasava", herbal (ayurvedik) tonic is derived from grapes. It is in the form of partial fermentation. Utilization of raisin concentrate is also followed for the preparation of "Drakshasava", ayurvedik tonic. The "Drakshasava" is *insisted* to be useful for treating the disorders (for example conditions of impassivity / lethargy, *condition of feebleness*/condition of weakness and heat-burnout (or heatstroke). The most significant categories of metabolites and herbal formulations derived from *Vitis vinifera* (L) linalool, grape seed oil and "Drakshasava", ayurvedik tonic[15].

Many more compounds of herbal origin; compounds of synthetic categories and animal derived biochemicals looming among the classified files of blends with characters mimicking the action of (analogous with) Insect Juvenile Hormone / J.H. The compounds of herbal origin; compounds of synthetic categories and animal derived biochemicals with the features mechanism of actions analogous with "Insect. Juvenile. Hormone" (J.H.) are designated as a special class of "JUVENOIDS" by Williams in the year: 1956 [16,17]. The topical applications of exogenous insect juvenoid compounds through suitable solvent (like acetone) to the larval instars of silk spinning worms with appropriate age (Unit: hours) are reported to exert influence through the inhibition of chitin-deposition in the body-wall and extension of age of the larval instars[18,19]. That is to say, the compounds of the class of "HERBAL-JUVENOIDS" through appropriate solvent are claimed for the effective activity of natural "Insect Juvenile Hormone" (J.H.) through impressive aggregate of all the reactions of metabolism (metabolic-turnover), modifications of constituents of biochemical metabolites, like protein-compounds, lipid-compounds, carbohydrate-compounds, amino-acids-pool, fatty-acids-pool & chitin. The chitin is long chain of polymer compounds of N-acetyl glucoseamine)[20,21]. There are number of reports with reference to improvements in the conditions of physiological conditions of body of life of insect larvae through the topical applications of juvenoid compounds. The exogenous compounds of herbal origin; compounds of synthetic categories and animal derived biochemicals with similar (analogous) features and working mechanism of natural juvenile-hormone of insects are reported for the utilization through topical applicationto the instars of silk spinning worms for the improvements in the quality of yield of silk[22-24]. "Terpene-compounds" and "Compounds of Terpenoids" are the substantial largest and diverse category of organic chemical compounds. Strong odor is the distinguishing character of terpene-compounds. The natural and herbal terpene-compounds are dealing with plant-protection (through deterring herbivorous-animals). They also protect the herbivorous animals through attracting predators and parasites[25-28].

The insect "Juvenile-Hormone" (J.H.) exert the influence concerned with maintenance of juvenile stage (younger and younger status) of life of insects. Prohibition of chitin-deposition in the body-wall and prolongation of the life duration of larval instars of insects are the most significant influence exerted by natural J.H. (and exogenous-juvenoid-compounds) in the body of larval instars of insects. The concentration or titer of natural insect Molting Hormone (M.H.) serves to get going to the subsequent phase of insect life. In other words, the strength (concentration / titer) of the insect "Molting-Hormone" (M.H.) serves for progress further metamorphosis. There are many calamities of working mechanism (including accelerated rate of chitin-deposition). Particular / specific titer of the Molting Hormone (M.H.) in the body of insect-life-stage, the working mechanism of chitin deposition in the body-parts of body-frame seems to be at accelerated rate. The significant feature of J.H. and its analogues is prohibition of morphogenetic-program at predetermined group-specific-ontogenetic or embryonic-developmental-positions. The integration of fruitful-interactions of available titers of the J.H. and M.H. It seems that, metamorphosis in insects is the product of fruitful integrations of specific titers of the J.H. and M.H.[16]. The J.H. and M.H., through their specific-concentrations (titers) are orchestrating for the fruitful progression of metamorphosis from larval instars to the pupal stages; from the pupal-stage to the adult stage. Earlier trials in the laboratory of authors, utilization of acetone extractives of stem pieces of grape, *Vitis vinifera* (L.) (through the topical applications, in the form of spray) was reported for exerting significant improvement in the quantity of both soluble protein content and contents of total protein in silk glands [20]. Therefore, for the purpose to analyze the effect of acetone solution of grape seed oil (topical application); acetone solution of linalool (topical application) and aqueous solution of Drakshasav (through the leaves of Mulberry) on commercial parameters in sericulture (fifth instar larval life duration; cocoon-weight; cocoon-shell-weight; silk-shell-ratio and denier scale of silk), present research work has sketched out.

Materials and methods

The attempt on "Utilization of grape seed oil, Linalool and Drakshsava for improvement of quality silk-cocoons from silk spinning worm, *Bombyx mori* (L)" has been completed through the steps like rearing of larval instars of Silkworm; Preparation of acetone solution of grape seed oil; Preparation of acetone solution of linalool; Preparation of aqueous solution of Drakshasav; supplying the leaves of mulberry to larval instars; mountage-provision for spinning; Collection of (harvesting) cocoons from mountage; reeling the cocoon for silk filaments; collection of data on commercial (economic) parameters and application of statistical methods for data analysis. The methods in practices dealing with sericulture (Krishnaswami, *et al*.) were followed[20,29].

The race of silk spinning worm, *Bombyx mori* (L.) utilized in this attempt was double-hybrid [(CSR6 x CSR26) (hybrid-bivoltine) x CSR2 x CSR27) (hybrid-bivoltine)]. The grape seed

oil; linalool and Drakshasav were procured through local supplier.
Acetone solution of grape seed oil (strength: 10 ppm or mg/liter) was established (by dissolving 10 mg grape seed oil in 90 ml acetone-solvent). Likewise, the solution of linalool in acetone-solvent (strength: 100 ppm or mg/liter) strength was prepared. Water solution of Drakshasav was prepared (by dissolving 10mldrakshasavin 90 ml distilled water (as a solvent). All the three solutions were made ready just few minutes before their application. The last stage (fifth stage) of larvae of silkworms was used in present attempt. Shortly, after the release of the fourth-molt, the larvae were transferred to separate disinfected tray and divided into different seven groups (1. Untreated Control; 2. Acetone / solvent Treated Control; 3. Water / solvent Treated Control; 4. Group dealing with Topical application of Acetone Solution of Grape seed Oil; 5. Group dealing with Topical application of Acetone Solution of Linalool; 6. Group dealing with Treating the mulberry leaves with Aqueous Solution of Drakshasav for feeding and 7. Group dealing with Topical application of Acetone Solution of Grapeseed Oil followed by feeding mulberry leaves treated with Aqueous Solution of Drakshasav).

Each and every group of the larval stages of fifth instars of silkworm was containing hundred individuals. Each and every group of the larval stages of fifth instars of silkworms was in the set of triplicates. The first group of larvae was considered as: Untreated-Control. The second group of larvae was considered as: Solvent / Acetone -Treated Control. The third group of was considered as: Water / solvent Treated Control. Fourth group of larvae was considered as: Topical application of Grape seed Oil. The fifth group of larvae was considered as: Topical application of linalool. The sixth group of larvae was considered as: Treating the mulberry leaves with Aqueous Solution of Drakshasav and feeding fifth instar larvae of silkworm. The seventh group of larvae was considered for Topical application of Acetone Solution of Grapeseed Oil followed by feeding mulberry leaves treated with Aqueous Solution of Drakshasav.

The group: “Untreated control” was without any treatment. Plain acetone-solvent (Ten milliliters) was used to spray over the group of hundred larvae of solvent treated group at forty-eight hours following the fourth moult. Topical application of ten milliliter of acetone solution of grape seed oil was executed at forty-eight hours following the process of fourth (on second day of fifth stage silkworm larvae). Household-Hand-Sprayer was used for topical application of acetone solution of grape seed oil to the larvae.

Ten milliliters of linalool (through acetone) were used to spray on the larvae (hundred) at forty-eight hours after the process of fourth-moulting. Household-Hand-Sprayer was used for topical application of acetone solution of linalool to the larvae.

The Drakshasav (through distilled water) application to the larvae (hundred) was in the form of feeding leaves of mulberry treated with Drakshasav water solution. 100 mg of fresh leaves of mulberry were used to keep in 100 ml of Drakshasav water solution for about an hour. The treated leaves of mulberry were decanted before feeding to the larvae at forty-eight-hours after fourth-moult. The solvent treatment group was fed with water treated mulberry leaves.

The seventh group was considered for treatment through topical application of Grape-seed Oil followed by feeding leaves of mulberry treated with water Solution of Drakshasav.

All the groups were maintained through the methods of practices dealing with sericulture[20,29] and prescribed by Krshnswami, *et al*. Fresh and tender leaves of mulberry were used for feeding the larvae. System of four feedings per day was followed. Schedule of hundred grams of leaves of mulberry was used to feed the group of hundred larvae for each feeding. Provision of mountage was made for spinning cocoon by mature larvae.

Age (life duration) (unit: Hours) of larvae was considered from the initial time of release of fourth molt to the time of fifty percent completion of spinning the silk cocoon. Larval weight and silk gland weight were used for calculation of tissue somatic index (TSI). Silk-cocoons were harvested from the mountage on sixth day after the provision of mountage. Random selection of fifty cocoons from each group was made. Twenty-five cocoons were used for determination of cocoon parameters. Remaining twenty-five cocoons were used for reeling the silk. Individual cocoon was processed for determination of weight through the use of electronic balance. The weight of each cocoon was recorded. Each cocoon was processed for vertical cutting through the use of sharp blade. Weight of silk-shell of individual cocoon was recorded. The readings pertaining weight of whole cocoon and weight of silk-shell were considered for calculation of silk-shell ratio. Twenty-five cocoons were processed for ten minutes of cooking through the use of boiling water. This cooking helps for separation of gum like sericin around the fibroin content of silk filament and achieve the ease in the process of reeling (without break). The Epprouvate (wheel / charakha) was utilized for reeling. The advantage of Epprouvate (wheel / charakha) is to get the reading of length of silk fibre reeled from individual cocoon. The length and weight of silk fibre reeled from individual cocoon were recorded. The reading of weight silk fibre was divided by the reading of length. Finally, the quotient was multiplied by nine thousand for denier scale. Thus, the characters accounted for analysis include the age (life duration) (unit: Hours) of larvae of larvae; whole cocoon weight; silk-shell-weight; pupal-weight (weight of pupa); silk-fiber-length and silk-fiber-weight. Elucidation of characters of the collected data (in digital form) used for analysis; for interpretation of the relationship of the data; abridgements of association among the data-units to elemental-groups; setting up validity and for heeding the analytics through the statistical methods of statistics[32]. Characters expected consider in the view of statistics in the attempt include:

statistical-mean, statistical-standard-deviation and statistical-percent-change. The percent-variations and test pertaining "student t– test" was considered for understanding the level of consequent-significance[30-32].

Results and Discussions

Results on use of Grape Seed Oil (GSO) through acetone; Linalool through acetone and Drakshasav through water for qualitative yield of silk and quantitative yield of silk spun by mature larvae of silkworm *Bombyx mori* (L) [Race: (CSR6 x CSR26) (hybrid bivoltine) x CSR2 x CSR27) (hybrid bivoltine)] are presented in tabular form (table No.1,2 and 3) and and presented through plotting the graphs (Figures-1,2 and 3). The life duration (age) (unit: hours) of silkworm-larvae (race: hybrid bivoltine)] of the untreated-control-group; acetone-treated-control group and control group silkworm-larvae received water treated leaves of mulberry was found recorded 145.33 (±13.786); 145.33 (±13.786) and 146.59 (±13.003) hours respectively (Table- 1 and Figure-1A).

The life duration (age) (unit: hours) of silkworm-larvae (race: hybrid bivoltine)] of the group treated with topical application of Grape seed oil (GSO) (through acetone) and the group treated with topical application of linalool (in acetone) was found recorded 168.73 (± 13.221) and 177.46 (± 13.786) hours respectively (table- 1 and Fig.1.A).The life duration (age) (unit: hours) of silkworm-larvae (race: hybrid bivoltine)] of the group received the leaves of mulberry immersed in water-solution of Drakshasav and the group of topical application of linalool (in acetone) solution of Grape Seed Oil (GSO) followed by feeding with leaves of mulberry immersed in water-solution of Drakshasav was found recorded 162.87 (± 14.572) and 168.58 (± 18.789) hours respectively (Table- 1 and Figure-1A).

The ratio of tissue / organ to the whole body (Tissue-Somatic-Index / TSI) signifies the percentage of tissue / organ in whole body. The ratio of tissue / organ to the whole body (Tissue-Somatic-Index / TSI) of the silk glands of larvae of the group: untreated control; group: acetone treated control and group: water treated control was found recorded as 31.426 units (Table-1 and Figure-1B).

The ratio of tissue / organ to the whole body (Tissue-Somatic-Index / TSI) of the silk glands of larvae of the group: treated with Grape Seed Oil (GSO) (in acetone) and the group: treated with Linalool (in acetone) was found recorded 52.625 and 52.728 units respectively (Table-1 and Figure-1B). (Tissue-Somatic-Index / TSI) of the silk glands of larvae of the group: received the leaves of mulberry immersed in water solution of Drakshasav and the group received the topical application of Grape Seed Oil (GSO) (in acetone) followed by feeding with leaves of mulberry immersed water-solution of Drakshasav was found recorded 52.759 and 53.854 units respectively (Table-1 and Figure-1B).

The whole cocoon (with floss) weight (unit: gm); whole cocoon (deflossed / without floss) (unit: gm) of the group: untreated control was found recoded 2.962 (±0.487) and 2.873 (±0.441) respectively (Table-2 and Figure-2A). The whole cocoon (with floss) weight (unit: gm); whole cocoon (deflossed / without floss) (unit: gm) of the group: Acetone treated control was found recorded 2.962 (±0.439) and 2.873 (±0.493) respectively (Table-2 and Figure-2A). The whole cocoon (with floss) weight (unit: gm); whole cocoon (deflossed / without floss) (unit: gm) of the group: water treated control was found recorded 3.146(±0.831) and 3.051 (±0.557) respectively. The whole cocoon (with floss) weight (unit: gm); whole cocoon (deflossed / without floss) (unit: gm) of the group: of topical application of Grape Seed Oil (GSO) (in acetone) was found recorded 5.381 (±1.078) and 5.219 (±1.081) respectively. The whole cocoon (with floss) weight (unit: gm); whole cocoon (deflossed / without floss) (unit: gm) of the group: topical application of Linalool (in acetone) was found recorded 5.596 (±1.788) and 5.427 (±1.149) respectively.

The whole cocoon (with floss) weight (unit: gm); whole cocoon (deflossed / without floss) (unit: gm) of the group: received mulberry leaves immersed in aqueous Drakshasav was found recorded 5.691 (±1.739) and 5.519 (±1.557) respectively. The whole cocoon (with floss) weight (unit: gm); whole cocoon (deflossed / without floss) (unit: gm) of the group: topical application of Grape Seed Oil (GSO) (in acetone) followed by feeding the larvae with leaves of mulberry immersed in aqueous Drakshasav was found recorded 5.738 (±2.013) and 5.564 (±1.786) respectively.

Silk shell percentage (shell ratio) of the cocoons of the group: untreated control and group: solvent treated was found recoded 19.422. Silk shell percentage (shell ratio) of the cocoons of the group: topical application of Grape Seed Oil (GSO) (in acetone) was found recorded 23.970. Silk shell percentage (shell ratio) of the cocoons of the group: topical application of Linalool (in acetone) was found recoded 27.989. Silk shell percentage (shell ratio) of the cocoons of the group: larvae received mulberry leaves immersed in aqueous Drakshasav was found recorded 28.989 units.

The parameter pertaining silk-filament (Denier-scale) of the group: Untreated Control and group: solvent (Acetone) Treated Control and group: Solvent (water) Treated Control was found recorded 3.243; 3.243 and 3.241 respectively. The parameter pertaining silk-filament (Denier-scale) of the group: Grape Seed Oil (GSO) (in acetone) treated was found recorded 4.706 units. The parameter pertaining silk-filament (Denier-scale) of the group: linalool (in acetone) treated was found recorded 4.793 units.

The parameter pertaining silk-filament (Denier-scale) of the group: larvae received the leaves of mulberry immersed in aqueous Drakshasav was found recorded 4.882 units. The parameter pertaining silk-filament (Denier-scale) of the group: The Denier scale of Grape Seed Oil (GSO) (in acetone) followed by feeding the leaves of mulberry leaves immersed in aqueous Drakshasav was found recorded 4.948 units.

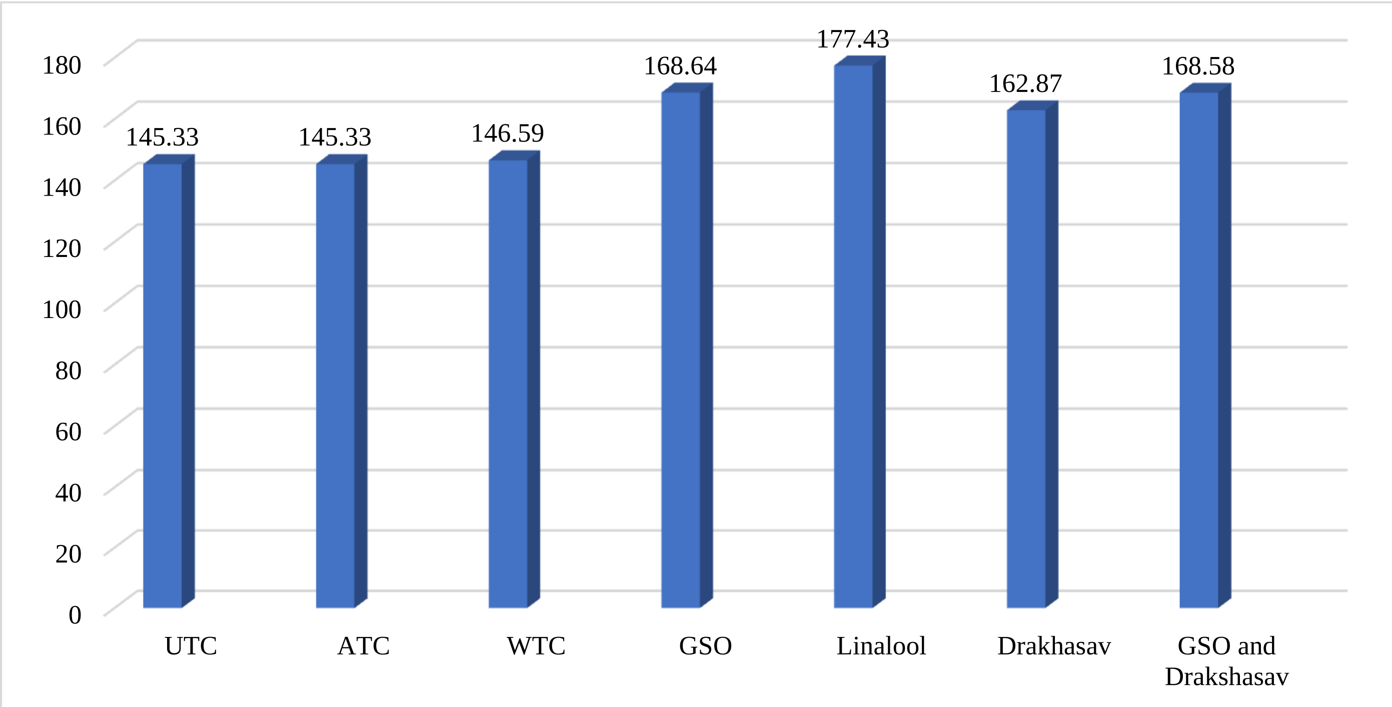

Figure-1A: Influence of herbal juvenoid formulations derived from *Vitis vinifera* (L.) (grape seed oil / GSO, linalool and Drakshasav) on the age (hours) of the fifth instar larvae of silkworm, *Bombyx mori* (L.).

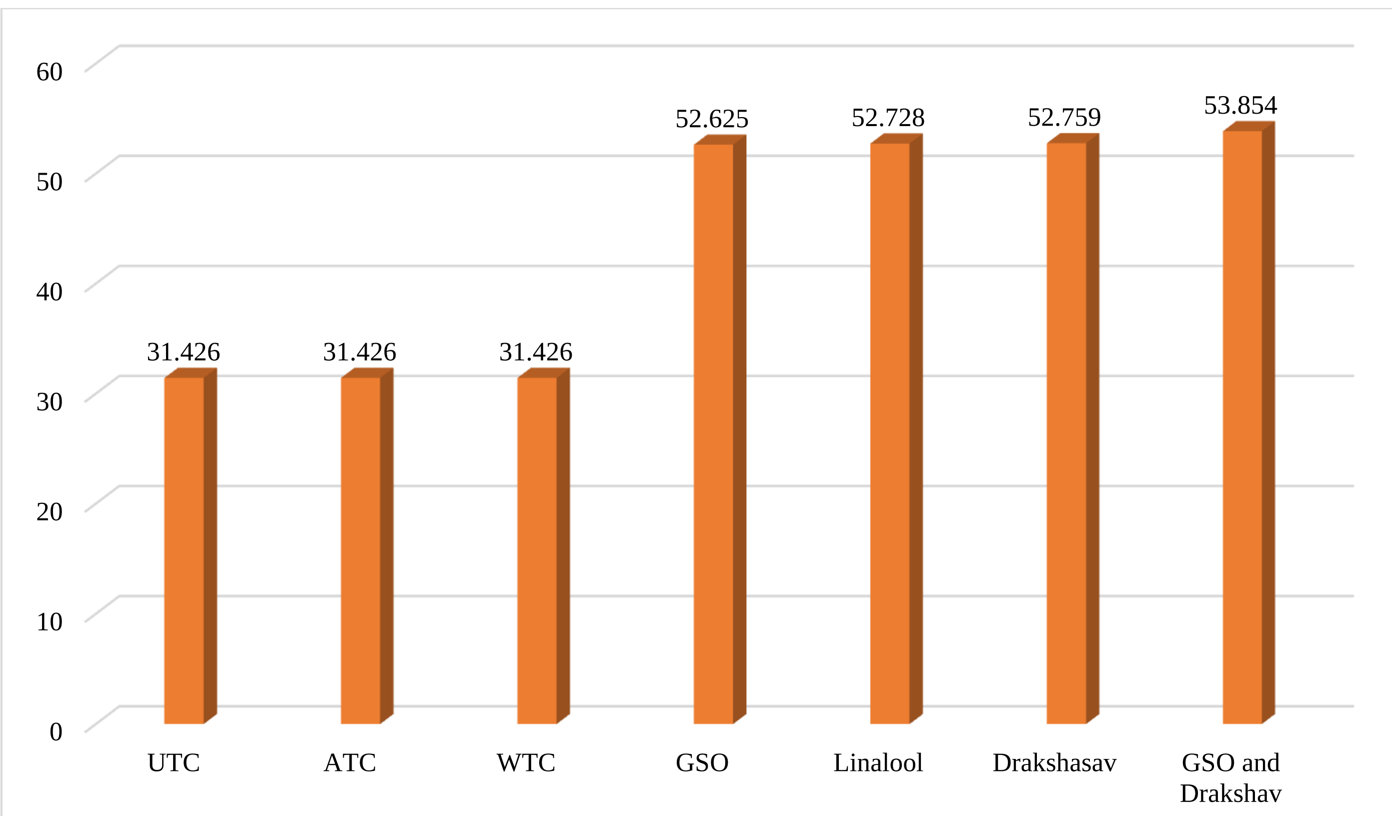

Figure-1B: Influence of herbal juvenoid formulations derived from *Vitis vinifera* (L.) (grape seed oil / GSO, linalool and Drakshasav) on the Tissue Somatic Index (TSI) in the fifth instar larvae of silkworm, *Bombyx mori* (L.).

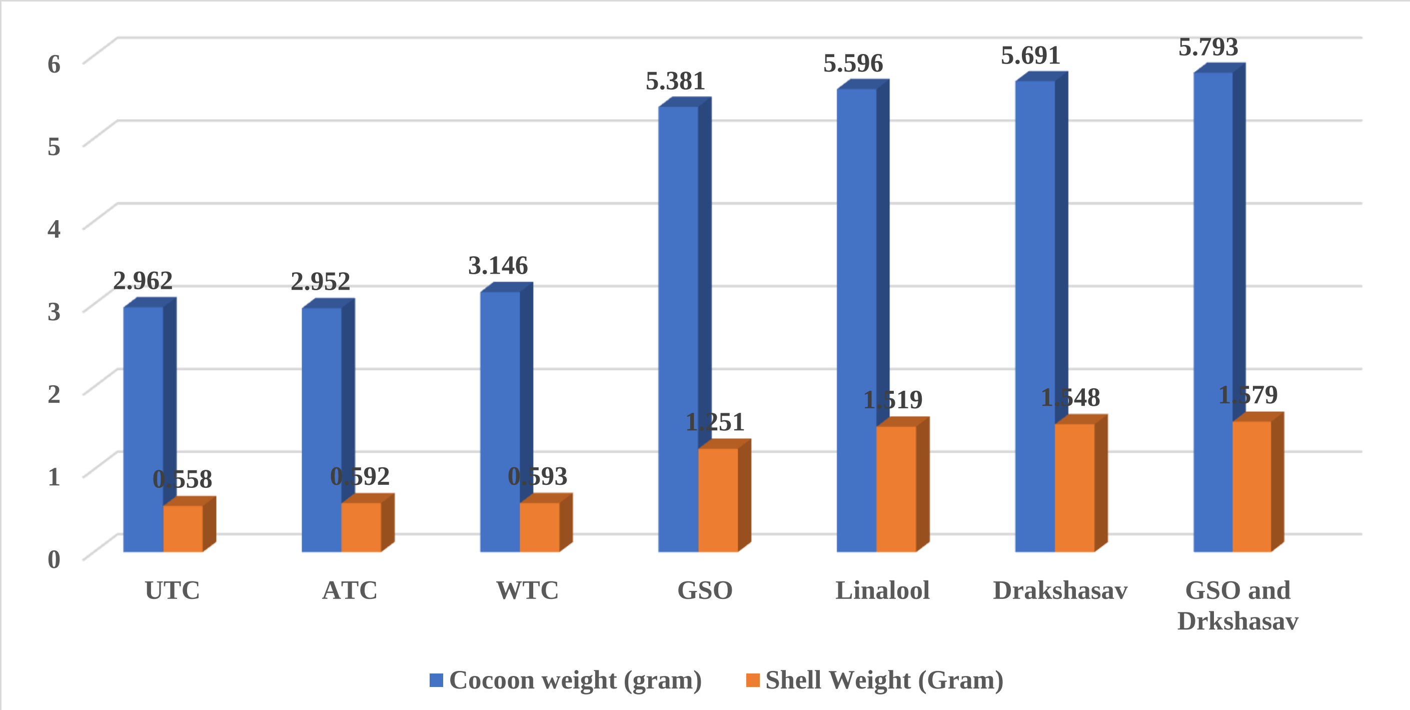

Figure-2A: Influence of herbal juvenoid formulations derived from *Vitis vinifera* (L.) (grape seed oil / GSO, linalool and Drakshasav) on the parameters of cocoon spun by the fifth instar larvae of silkworm, *Bombyx mori* (L.).

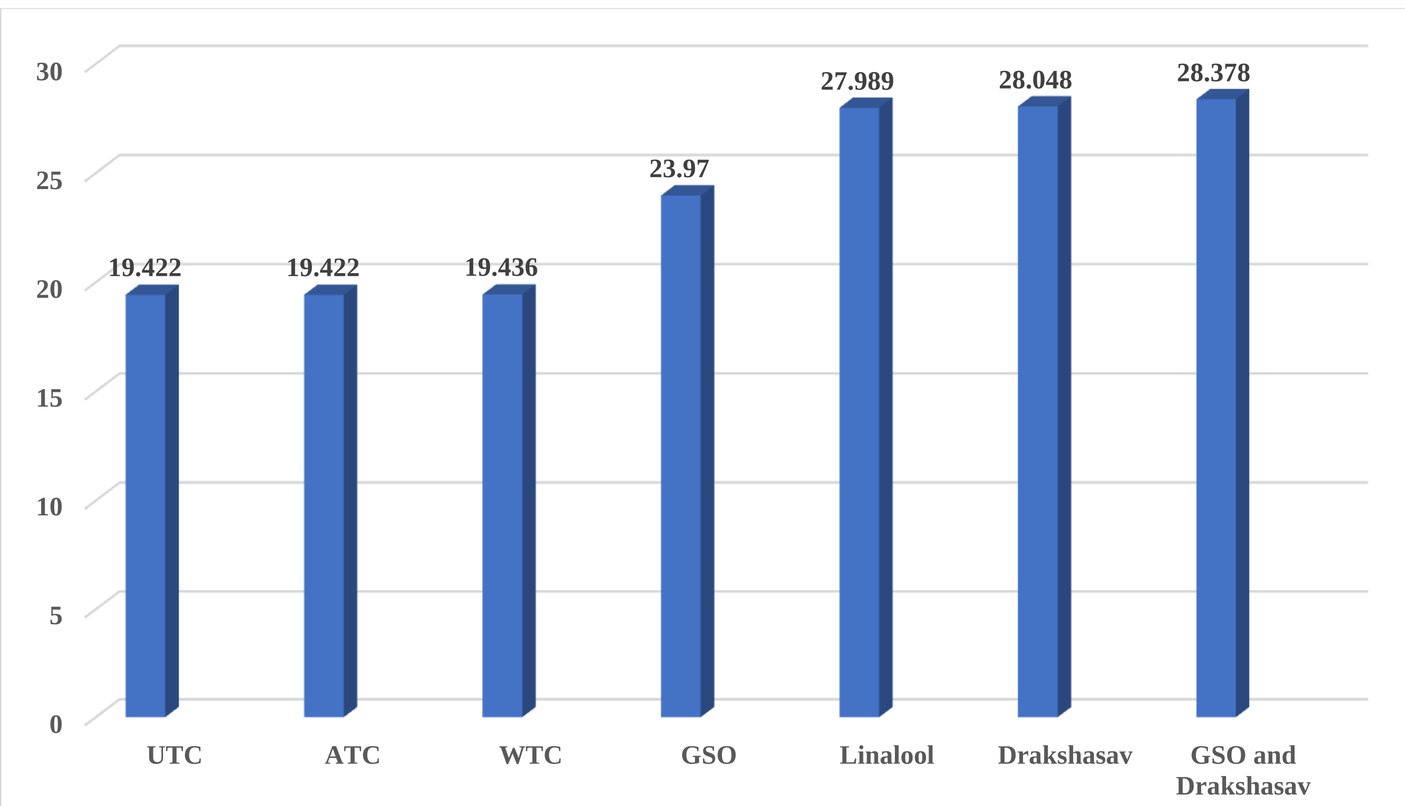

Figure-2B: Influence of herbal juvenoid formulations derived from *Vitis vinifera* (L.) (grape seed oil / GSO, linalool and Drakshasav)on the Shell Ratio of silk-cocoons spun by the fifth instar larvae of silkworm, *Bombyx mori* (L.).

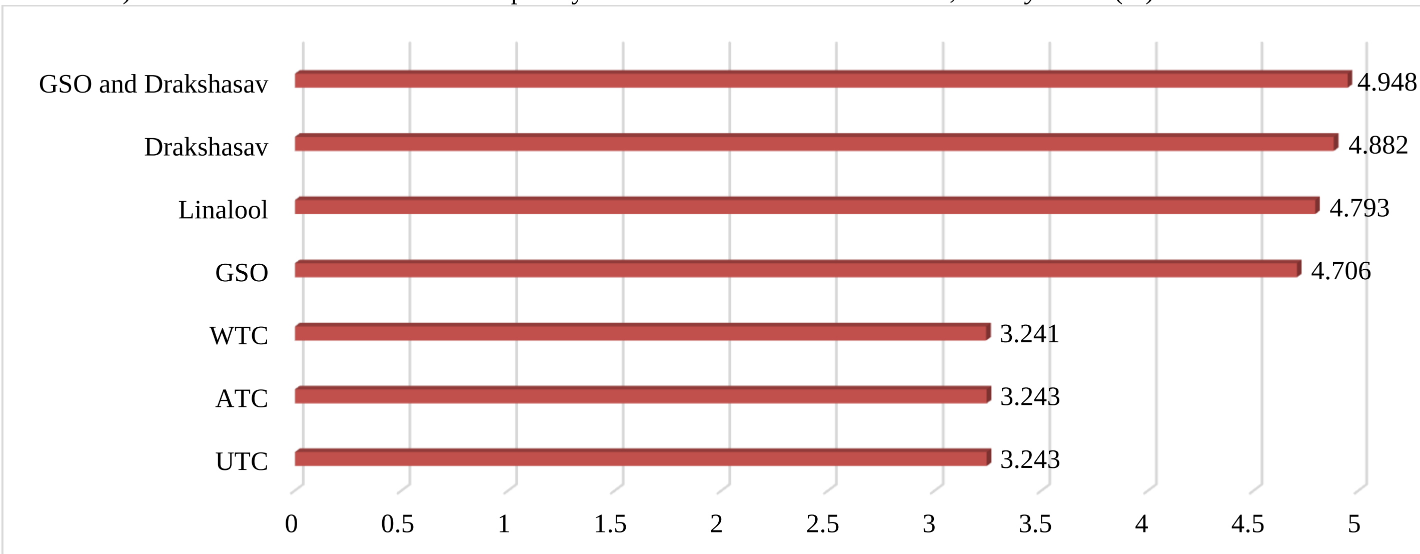

Figure-3: Influence of herbal juvenoid formulations derived from *Vitis vinifera* (L.) (grape seed oil (GSO), linalool and Drakshasav)on the Denier Scale of Silk reeled from the cocoons spun by the fifth instar larvae of silkworm, *Bombyx mori* (L.).

Table-1: Characters of the fifth instar larvae of silkworm treated with herbal juvenoid formulations derived from *Vitis vinifera* (L.).

Parameter Group	Fifth Instar Larval Life Duration (Hours)	Fifth Instar Larval Weight (Gram)	Fifth Instar Silk Gland Weight (Gram)	Tissue Somatic Index of Silk Glands
Untreated Control	145.33 (± 13.786) 00.000	03.478 (±00.332)	01.093 (±00.107)	31.426
Acetone Treated (Topical) Control	145.33 (± 13.786) 00.000	03.478 (±00.337)	01.093 (±00.111)	31.426
Water Treated (Through Mulberry Leaves) Control	146.59 (± 13.003) 00.867	03.478 (±00.339)	01.093 (±00.119)	31.426
Acetone Solution of Grapeseed Oil Treated (Topical)	168.73* (± 13.221) 16.101	05.294* (±00.569) 52.213	02.786* (±00.213) 154.89	52.625*
Acetone Solution of Linalool Treated (Topical)	177.46** (± 13.786) 22.108	05.479** (±00.623) 65.353	02.889* (±00.339) 186.00	52.728*
Aqueous Solution of Drakshasav (Through Mulberry Leaves)	162.87** (± 14.572) 12.069	05.563** (±00.786) 59.948	02.935** (±00.362) 168.52	52.759**
Acetone Solution of Grapeseed Oil Treated (Topical) followed by Aqueous Solution of Drakshasav (Through Mulberry Leaves)	168.58*** (± 18.789) 15.998	05.786*** (±00.674) 66.359	03.116*** (±00.519) 173.01	53.854***

- Each Figure is the mean of the three replications; -Figure with ± sign in the bracket is standard deviation;-Figure below the standard deviation is the increase for calculated parameter and percent increase for the others over the control. *:P < 0.05; **: P < 0.005; ***: P < 0.01

Table-2: Characters of cocoon spun by the fifth instar larvae of silkworm treated with herbal juvenoid formulations derived from *Vitis vinifera* (L.).

Parameter Group	Weight of Whole (with floss) Cocoon (Gram)	Weight of Whole (without floss) Cocoon (Gram) (A)	Weight of Silk Shell of Cocoon (without floss) (Gram) (B)	Silk Shell Ratio [(B÷A) x 100]
Untreated Control	2.962 (±0.439) 00.000	2.873 (±0.441) 00.000	0.558 (±0.017) 00.000	19.422
Acetone Treated (Topical) Control	2.962 (±0.487) 00.000	2.873 (±0.493) 00.000	0.592 (±0.033) 00.000	19.422
Water Treated (Through Mulberry Leaves) Control	3.146 (±0.831) 00.000	3.051 (±0.557) 00.000	0.593 (±0.041) 00.000	19.436
Acetone Solution of Grapeseed Oil Treated (Topical)	5.381* (±1.078) 81.667	5.219* (±1.081) 81.667	1.251* (±0.069) 124.19	23.970*
Acetone Solution of Linalool Treated (Topical)	5.596** (±1.788) 88.667	5.427** (±1.149) 88.896	1.519** (±0.347) 172.22	27.989**
Aqueous Solution of Drakshasav (Through Mulberry Leaves)	5.691*** (±1.739) 92.133	5.519*** (±1.557) 92.098	1.548*** (±0.786) 176.88	28.048***
Acetone Solution of Grapeseed Oil Treated (Topical) followed by Aqueous Solution of Drakshasav (Through Mulberry Leaves)	5.738*** (±2.013) 93.720	5.564*** (±1.786) 93.665	1.579*** (±0.998) 182.79	28.378***

- Each figure is the mean of the three replications; -Figure with ± sign in the bracket is standard deviation.; -Figure below the standard deviation is the increase for calculated parameter and percent increase for the others over the control.*: P < 0.05; **: P < 0.005; ***: P < 0.01

Table-3: Characters of silk reeled from the cocoon spun by the fifth instar larvae of silkworm treated with herbal juvenoid formulations derived from *Vitis vinifera* (L.).

Parameter Group	Silk Filament Length (meter) (C)	Silk Filament Weight (gm) (D)	Denier Scale of Silk Filament [(D ÷ C) x 9000]
Untreated Control	1173.88 (±119.53) 00.000	0.423 (±0.087) 00.000	3.243 00.000
Acetone Treated (Topical) Control	1173.88 (±119.53) 00.000	0.423 (±0.087) 00.000	3.243 00.000
Water Treated (Through Mulberry Leaves) Control	1171.84 (±113.52) 00.000	0.422 (±0.089) 00.000	3.241 00.000
Acetone Solution of Grapeseed Oil Treated (Topical)	1497.21* (±216.64) 27.543	0.783** (±0.123) 85.106	4.706*** 01.463
Acetone Solution of Linalool Treated (Topical)	1494.61* (±169.55) 27.322	0.796** (±0.118) 88.179	4.793*** 01.550
Aqueous Solution of Drakshasav (Through Mulberry Leaves)	1509.55* (±173.55) 28.594	0.819** (±0.129) 93.617	4.882*** 01.639
Acetone Solution of Grapeseed Oil Treated (Topical) followed by Aqueous Solution of Drakshasav (Through Mulberry Leaves)	1533.28* (±352.78) 30.616	0.843** (±0.387) 99.290	4.948*** 01.705

- Each figure is the mean of the three replications; -Figure with ± sign in the bracket is standard deviation; -Figure below the standard deviation is the increase for calculated parameter and percent increase for the others over the control.*: $P < 0.05$; **: $P < 0.005$; ***: $P < 0.01$.

The preeminent and most-significant character in sericultural practices present in the yield of silk in the form of silky-cocoons spun by silkworm-larvae. The silky-cocoons are exclusive source for marketable silk-filament (silk fiber). Extension of the life of is the significant feature of insect larvae recipient of exogenous chemical compounds with juvenoid activity. Majority of the terpene-compounds used for topical applications to the silkworm-larvae are imitating the functioning implementation of naturalistic Insect-Juvenile-Hormone-Analogue (JHA)[20-25]. The significant increase (12.069 to 22.108 percent) in the life duration (age) of silkworm-larvae (fifth-instar-larval-stage) in present resent research work is acceptable to tag the Grape Seed Oil (GSO); Drakshasav and Linalool as “Herbal source Insect Juvenoid Formulation” and “Insect Juvenoid compound” respectively. Most possible working mechanism of “Herbal source Insect Juvenoid Formulation” and “Insect Juvenoid compound” is to extend the larval duration / age. The larval instars of silkworm may have been utilized the system of extension of larval life for more consumption of food material, more secretion of silk, spinning the larger and fortified silk shell. For the stronghold the perception, more attempts of studies (on effect of Grape Seed Oil (GSO); Drakshasav and Linalool on deposition of chitin in the body-wall of insect-larval stages are crucial.

Use of “Herbal source Insect Juvenoid Formulation” and “Insect Juvenoid compound” for farming the silk-spinning-larvae larval stages of silkworm seems to be easier method. Use of “Herbal source Insect Juvenoid Formulation” and “Insect Juvenoid components” will open a new boulevard in occupation of farming the silk-spinning-worms for the quantitative and nuanced research findings of yield of silk.

Conclusion

The present research work is reporting crucial influence on the silk-yield using of acetone Grape Seed Oil (GSO)(in acetone); Linalool (in acetone) for topical applications and feeding the larvae with leaves of mulberry immersed in aqueous “Drakshasav” to the fifth instar-larvae of silk-spinning-worm. The significant increase (12.069 to 22.108 percent) in the life duration (age) of silkworm-larvae (fifth-instar-larval-stage) in present resent research work is acceptable to tag the Grape Seed Oil (GSO); Drakshasav and Linalool as either “Herbal source Insect Juvenoid Formulation” or “Insect Juvenoid compound”.

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