Silk Association of India (SAI)
NEWSLETTER

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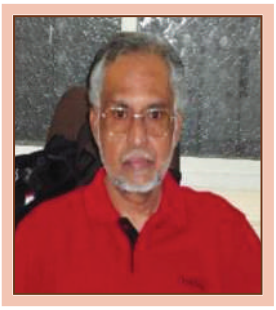
From the President's Desk.....

Mulberry Thrips and Mites Menace



Mulberry is the sole food plant of mulberry silkworm (***Bombyx mori* L.**). While it is an unrestrained source of nourishment and a potential host for a variety of pests, the intensity of qualitative and quantitative damage caused to mulberry foliage varies depending on the season and from species to species. Mulberry hosts large number of insect pests and some of them *viz.,* thrips, whitefly, papaya mealy bug, pink mealy bug, leaf roller and Bihar hairy caterpillar cause severe damage to mulberry plant, reduce the biomass, decline the leaf nutritional value and make it unfit for feeding silkworms.

Although, scientists have estimated and reported a normal 20% damage due to the infestation of Mites and Thrips in the southern belt of our country, it is learnt from the field studies that the actual damage is quite high and it is in excess of 60-70%. It is reported that the infectivity rate is low in Chamarajnagar, Mysuru and Ramanagara districts of Karnataka, but it is spreading in other districts and also to the neighboring states like, Andhra Pradesh, Tamil Nadu and Maharashtra.

Many farmers are frustrated and have attempted uprooting of mulberry. As a result of this;

- there is a decrease of mulberry leaf yield by 60-70%
- cocoon production is likely to be less by more than 40%
- demand for silkworm seed has considerably reduced and grainages are facing problems in disposing off their produce
- chawki brushing and distribution has also come down proportionately
- cocoon production and transaction in cocoon markets has already come down and it will worsen in coming days
- owing to the low arrival of cocoons in the markets, reelers are unable to run their units economically.

It is ascertained through interactions with the farmers that all the recommended physical, biological, and chemical measures are not significantly effective in controlling these pests. Especially the chemical control measures, instead of controlling the pest incidence are creating more problems due to their higher residual effects. The situation is very much alarming. In the light of this, it is time for us to reorient our research strategies and concentrate more on innovating the promising biological control and other easy to use, economical, with no residual effects and non-toxic methods to contain the pests and save the industry.

A mission mode approach by all the institutes involved in the R and D activities of pest control, would yield fruitful results and suggest a suitable remedy. In order to accomplish this, a national level task force should be constituted and headed by CSRTI, Mysuru. Simultaneously, experts from other advanced countries may also be consulted to understand the prophylactic and control measures they take to avoid and control pests' incidences in mulberry fields.

V.Balasubramanian, IAS (Retd)

Mulberry Cultivation and Silkworm Rearing in Rainy Season

S V Siddareddy
Assistant Director of Sericulture, Govt. of Karnataka

Mulberry cultivation is aimed at quality leaf production with higher yield and silkworm rearing for quality cocoons with higher yield so that the farmer gets desired profit. Many Research institutes have recommended package of practices so that by adopting these practices the income of the farmers is increased by way of higher yield and improvement in quality and productivity. In addition some progressive farmers have also developed technologies for adoption so that there is improvement in quality and yield. Mechanisation has helped to reduce cost of production and drudgery.

Compared to other seasons, during rainy season care to be taken in both mulberry cultivation and silkworm rearing to get a good crop. The reason being, during rainy season humidity will be comparatively high, favourable for the multiplication of disease causing pathogens. Muscardine and Aspergillosis, the fungal diseases are most common during rainy season as well as Grasserie and Flacherie.

Best practices to be followed in rainy season are explained below for the benefit of the sericulture farmers for getting better yields during rainy season also.

Mulberry cultivation

Before onset of monsoon the mulberry garden has to be made ready. Trenching and mulching of the garden with farm yard / compost manuring is to be taken up so that the roots get good aeration. Wider spacing for mechanisation with stump height of 18" to 24"is preferred. First equal dose of straight fertilisers in the ratio of N P K, 140: 70: 20 per acre per year has to be applied. After 20 days thinning of garden by removing weak branches is done. It is better not to use urea during rainy season. Due to application of urea, the leaves become succulent and attract Pests and Diseases as also it affects the health of silkworms. About 40,000 branches per acre are to be maintained irrespective of the spacing of the plants. The height of each the branch shall be 4.5' to 5.0' with 30 to 32 fully grown leaves.

Common diseases / Pests noticed are:

Diseases:

Powdery mildew: Spray 180 to 200 litres of Bavistin solution per acre, 2gms per litre of water on the lower surface of leaves. Leaves may be used for rearing after 15 days of spray.

Bacterial blight: Spray 180 to 200 litres of Streptocycline solution per acre. Streptocycline is available in 6 gms sachet. It is mixed with 50 litres of water.

Leaf spot: Spray 180 to 200 litres of Captan / Captaf solution per acre, 2gms per litre of water. Leaves may be used for rearing after 15 days of spray.

Pests:

Thrips and Mites: Spray 180 to 200 litres vettable sulphur solution per acre, 3 gms of grannules per litre of water. There is no residual effect and the leaves may be used for rearing.

Leaf roller: Spray 180 to 200 litres Nuvan solution per acre, 0.5 ml per litre of water. Leaves may be used for rearing after 10 days of spray.

Opening of trenches by using tractor

Filling of mulberry waste for mulching

Raising green manure crop and *insitu* mulching in rainy season is recommended.This is an effective method to improve health and fertility of soil and to control weed growth. Horse gram, 8 – 10 kgs / Cowpea, 5 – 6 kgs / Sunhemp, 5 – 6 kgs is sowed simultaneously with pruning of mulberry plants. The crop is incorporated into soil commensuration of flowering by ploughing. Weed control has to be done during rainy season by using rotovator ploughing.

Green manure crop - Cowpea

***In situ* mulching using Rotovator**

Silkworm rearing:

Disinfection is the most important activity to make the rearing hall germ free. One week earlier to taking up rearing disinfection work should be initiated. Bleaching powder @ 3 kgs per 100 litres of water is prepared according to the area of rearing. 2 litres of prepared solution is required per sq. meter of plinth area of rearing building. After 2 – 3 days,one more disinfection with Decol / Sanitech or any other recommended disinfect has to be taken up. The disinfection shall be thorough so that all the disease causing germs are destroyed. If the previous crop is infected with muscardine or during rainy and winter season some of the progressive farmers disinfect the rearing house with Captan / Captaf @ 2 gms per litre of water. The floor of the rearing house is cleaned with any detergent solution. 3 kgs of detergent is required for a rearing house measuring 20' x 50'. The soap solution is made to store in the ground and the floor is swabbed thoroughly to clean the floor. The rearing hall is kept open for aeration and to dry the floor. The next day silkworms may be received for rearing or chawkie brushing may be done. During moult the bed is to be kept dry by dusting dry slaked lime powder and by allowing cross ventilation. Heaters or charcoal stoves may be used to raise the temperature to optimum level. The bed must be kept thin so that there is no accumulation of humidity in the bed. Before giving first feed after each moult recommended bed disinfectants is dusted and after 30 minutes the silkworms are fed. Storing of mulberry shoots in the rearing area should be avoided. Care should be taken not to give excess leaves. Two feeds per day is sufficient in the form of shoots from III stage onwards. Top clipping of mulberry plants is recommended when the worms settle for IV moult.

Maximum aeration is required on V, VI and VII day of V age. Plastic collapsible chandrikes are spread on the bed to allow the silkworms to spin cocoons. Aeration to the maximum extent is provided so that the humidity in the form of urination is dried. After 72 hours of spinning, the collapsible chandrikes are dismantled from the bed and kept above the bed. Some farmers store the chandrikes with cocoons in a vacant top bed after 72 hours of spinning so that dry atmosphere is available to the cocoons. On V day of spinning when all the worms are transformed in to pupae the cocoons are harvested and stored in thin layers and marketed on VII day. If seed cocoons are reared, they are transacted on IX day of spinning.

Dismantling of plastic mountages after 72 hours of spinning and storing in vacant shelf

The bed refuse is collected for composting and the rearing hall is cleaned thoroughly.

By adopting these technologies the farmers may harvest good crops with higher yield during rainy season.

Success Story of Sri Ramesh : A Bivoltine Farmer

M Ramachandra Gowda

India is the second largest producer of silk with a production of 23,896 tonnes of mulberry silk of which 6,783 tonnes is of bivoltine variety. Karnataka is the premier silk producing State in the country contributing to nearly half of the mulberry silk production. Kolar District is known for gold, silk and milk. It is a traditional district practicing sericulture in all the 6 taluks. The row system of mulberry cultivation practiced in the district was also known as "Kolar System". This district has mulberry are of 19,329 hectares under irrigation. About 135 lakhs of layings are brushed to produce 9,192 tonnes of cocoons and from this 1,307 tonnes of silk including 219 tonnes of bivoltine silk is produced and the district ranks 4th in production of silk in the State.

Ever since JICA project was implemented in Bangarpet taluk, it became bivoltine cocoon producing area and a role model to the other taluks of the State and neighbouring States. All the row system mulberry gardens were changed to pit system either by up-rooting of the plants or by fresh plantation. Now there are no gardens with row system of plantation. There are many progressive farmers in the taluk who have set examples to the farmers motivating to adopt bivoltine sericulture and help the nation to reduce dependency on imported silk.

Hoskote is a small village near Bangarpet with about 65 families, all the families are engaged in sericulture activity. This village is better known as"high tech village" among the sericulturists of the district. Sri. Ramesh is a progressive sericulture farmer of this village adopting time tested technologies and getting better yield and thus a role model.

Sri Ramesh inherited 2 acres of land from his father is now a owner of 25 acres. All the 25 acres are planted with mulberry with a spacing of 8' X 3'with drip irrigation facility. The wider spacing is for mechanised cultural practices with tractor and JCB. There are 3 bore wells with a yield of 4000 gallons each sufficient to irrigate the mulberry area. About 20 acres are with V1 plantation and remaining 5 acres with G4 variety. He purchases 50 lorry loads of compost every year and uses it to the mulberry garden along with the bed waste by trenching and mulching. Every year green manure plants are grown and mulched to the soil so that the soil fertility is maintained. He says that no disease is noticed in the mulberry garden except stray cases of leaf roller which is controlled by spraying recommended pesticide. He uses DAP as chemical fertiliser on the recommendations of soil testing results at the rate of 2 bags / acre per crop.

Sri. Ramesh has 2 twin rearing houses measuring: 120 feet long, 24 feet wide and the height is 18 feet on one side lowering to

14 feet on the other side. The building is portioned in the middle by a 10 feet room to store mulberry shoots. The other rearing building is 80 feet long, 23feet wide and the height is 18 feet on one side lowering to 14 feet on the other side. This building is portioned in the middle by a 10 feet gap to store mulberry shoots. Both the buildings have a veranda of 20feet wide all along the length. Foggers are fixed around the building to increase humidity and bring down temperature. The building has sufficient widows and ventilators fitted with wire mesh to control uzi. On the top of each rearing room there are 3 industrial exhaust fans to exhale air from the rearing building to enable cross ventilation. Each rearing building has 7 tier rearing racks on two sides, 55 feet long and 6 feet wide in the first building and in the other building has a 7 tier rearing racks on two sides, 40 feet long and 6 feet wide. The gap between each tier is 2 feet. A disinfection tank with 3 chambers is built to disinfect appliances by dipping.

The rearing buildings are disinfected with bleaching powder solution and other recommended disinfectants like decol, sanitech and astra. Lime powder and bed disinfectants are used as per recommendation.

Two batches of rearings of 1000 layings each are conducted every month, one in each building, thus 24 rearings are conducted in a year. During favourable season of 8 months, FC1 and FC2 layings are reared and during summer season of 4 months bivoltine hybrids are reared. The cocoons produced from FC1 and FC2 layings are supplied to grainages and the bivoltine hybrid cocoons are sold at cocoon market, Kolar. Sri. Ramesh explains that about 60% of the earnings will be expenditure on labour and other maintenances and gets a profit of 40%. He proudly says that by adopting suitable technologies crop loss could be avoided in all seasons.

Sri Ramesh has a joint family supported by his father, wife, brother, brothers wife, 4 children. He has engaged 20 permanent labourers to manage mulberry garden and rearings and another 20 labourers are hired during each crop during spinning and harvesting of cocoons. Several farmers of Karnataka State and neighbouring States visit him to get the knowledge in mulberry cultivation and silkworm rearing. He guides them with the technologies he is following and shows the garden and rearings.

Sri. Ramesh is honoured by several awards recognising his efforts in getting highest yield and quality cocoons. Some of them are:

- ✓ First prize during 2012-13 from the Department of Sericulture, Govt. of Karnataka
- ✓ Third prize during 2013-14 from the Department of Sericulture, Govt. of Karnataka
- ✓ Andhra Pradesh State award

Sri Ramesh suggests the farmers to take up sericulture in large scale and wipe out rural poverty by implementing the technologies recommended and rearing bivoltine silkworms.

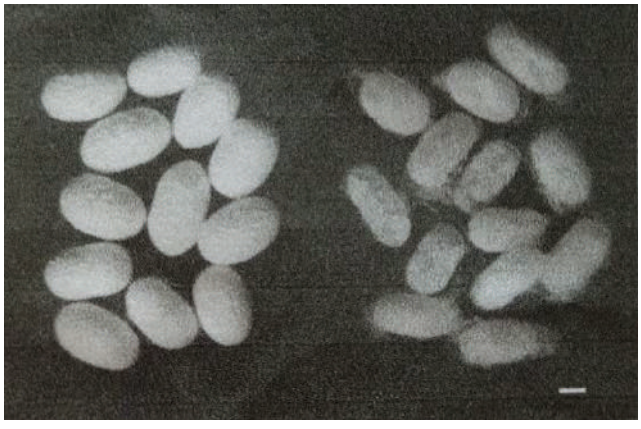
A new silkworm race "SERICIN HOPE" for production of Virgin Sericin

H K. Basavaraja and B S. Angadi

Sericin which is about 25% of the total cocoon shell of the silkworm *Bombyx mori* has a skin moisturing effect and an inhibitory effect against lipid per oxidization and tyrosinase activity. Because of these properties, it has come to use in the skin care industry. To effectively produce intact sericin protein, a new silkworm race "SERICIN HOPE" was developed by cross breeding Nd mutant (naked pupa) and high cocoon yield strain KCS83. The new strain spins sericin cocoons at a frequency of 99%. The cocoon weight is more than 4 times heavier than that of the Nd mutant. The sericin hope cocoon named "Virgin Sericin" can be gelled in water with less hydrolyzing by autoclaving at 110° C for 10 min. The VIRGIN SERICIN gel can be easily emulsified, firmly creamed or made into foam with 5% oil.

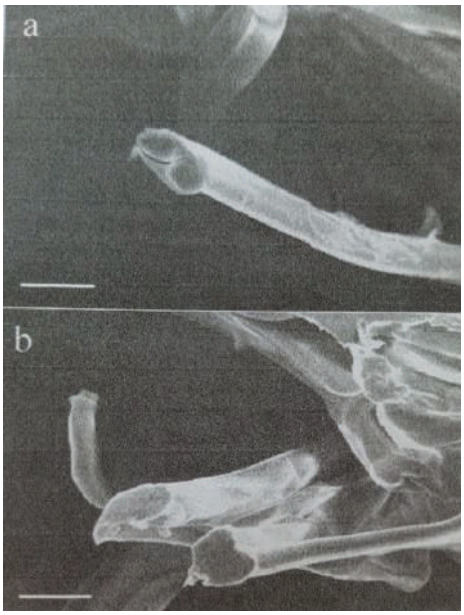
Sericin is known to have a skin moisturizing effect due to its many hydrophilic amino acids. It accelerates mineral absorption in the intestine and enhance cell proliferation. Thus Sericin has been put to practical use in the skin care in medical and food industries.

Two silkworm mutants Naked pupa (Nd) and Sericin cocoon (Nd-s), synthesize little fibroin H-chain and cannot synthesize the L-chain protein respectively. These mutant strains might be useful in obtaining a pure sericin protein in spite of their little productivity. In order to increase the pure sericin productivity, developed a new silkworm race "SERICIN HOPE" by breeding the mutants with a high cocoon producing strain. The productive strain, KCS83 was used as one of the breeding materials. The F1 female of KCS83 x Nd or KCS83 x Nd-s was backcrossed with KCS83, and the progenies having fragile cocoon layers were selected and sib-mated in every subsequent generation.



Cocoons of an ordinary race, KCS83 (left) and SERICIN HOPE (right).

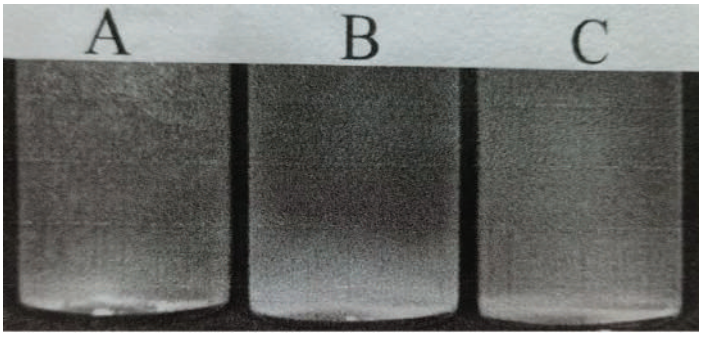
Unlike ordinary races the newly developed race from the KCS83 x Nd progeny consistently produced many sericin cocoons without fibroin and the cocoon surface showed opaque amorphous masses and a mano-fiber-like structure in which no fibroin filament. This has been named as new race "SERICIN HOPE".



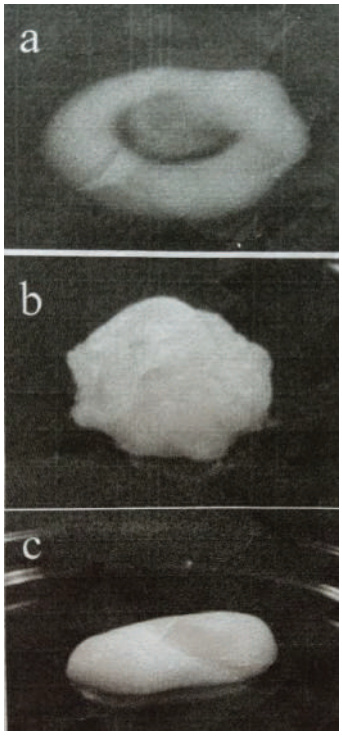
Scanning electron microphotograph of SERICIN HOPE cocoon shell. a - normal cocoon filament, KCS83; b - SERICIN HOPE.

The cocooning percentage of SERICIN HOPE has been greatly improved to 99% with high yielding strain KCS83. Degumming disclosed that 98.5% of the weight of the cocoon shell was composed of sericin.

Why can sericin hope produce cocoon at higher frequency? It has been speculated that silkworm spinning is performed by two process. 1) The inside pressure in the silk gland increases due to the large amount of liquid silk protein and 2) Traction of fibrous silk occurs due to head moving of the larva at the spinning stage. The present result indicates that the inside pressure in the silk glands caused by the large production of liquid silk protein



1% colloidial solution of VIRGIN SERICIN spun by SERICIN HOPE. A - 105°C; B - 110°C; C - 115°C autoclaving for 10 min each. A lot of while particles are observed only in bottle A.



Different forms of emulsified sericin. a - emulsion; b - cream; c - foam.

contributes to the spinning process of the silkworm. One reason for the higher cocooning of SERICIN HOPE might be the higher in the silk glands.

As SERICIN HOPE is genetically fixed in the parent Nd/Nd state the sericin cocoon dominantly produced for F1 larvae was 10% higher than that of the parent. From the results SERICIN HOPE seems to be extremely beneficial for sericin cocoon production.

In order to use the sericin derived from sericin hope without any chemicals a powered sericin was forcefully derived in 100 times volume by hot water by autoclaving for 10 min. Solid sericin remain as a lot of water of white particles in solution at 105° C, but it was not seen at temperature above 110° C. Here named sericin produced by SERICIN HOPE "VIRGIN SERICIN"as a new natural sericin material.

The results indicate that the VIRGIN SERICIN solution can be dissolved in water with less Hydrolyzing by autoclaving at 110° C for 10 min. was gelled with a few hours and was easily emulsified by mixing with oil. This emulsion was turned into a firmer creams using 5% VIRGIN SERICIN solution and foam mass created by mixing with oil before gelation. These processed sericins may be fit for use as natural cosmetic materials without any artificial additives. Based on these findings, the VIRGIN SERICIN produced by SERICIN HOPE is expected to be widely used as a new cosmetic material.

(The study was published in Journal of Insect Biotechnology and Sericology 75, 85-88 (2006))

Webinars Conducted by SAI

Silk Association of India conducted the following four Webinars from April to June 2021, for the benefit of all stakeholders of silk industry. As evidenced by number of participants, response to our efforts is very much encouraging. Requests are pouring in for conducting Webinars more frequently. The power point presentations and recommendations of all the Webinars are available on our website www.saoi.in

1. Mulberry Cultivation and Silkworm Rearing during Summer season (10-04-2021):

Resource Persons:

Dr. Srikantaswamy, Joint Director (Retd), CSR&TI, Mysuru

Dr. E. Muniraju, Scientist (Retd), KSSRDI, Bengaluru

Webinar was mainly focused on suitable technologies required to maintain soil nutrition management for good growth of nutrient mulberry and quality cocoon harvest.

- Adopting soil test based manure and fertilizer application
- Soil moisture conservation through drum kit technology
- Soil Organic carbon maintenance through adopting growing, trenching and mulching of the grown green plants
- Silkworm rearing practices like shoot preservation methods, silkworm rearing, spacing, feeding, aeration and mounting methods were discussed
- Maintenance of cool environment in rearing hall adopting water sprinklers, roof top turbines for better aeration and roof cover with thermo cool paints or coconut palms.

2. Mulberry Cultivation and Silkworm Rearing during Rainy Season (08-05-2021):

Resource Persons:

Dr. Mogli. T, Scientist (Retd), CSR&TI, Mysuru

Dr. C.S Gururaj, Scientist-F (Retd), KSSRDI, Bengaluru

- Application of compost minimum 8 -10 tones/acre/year in two split doses
- Application of soil test based fertilizer
- Maintenance of required 28°C for chawki, 25°C during late age using heating system
- Use of bed disinfectants for muscardine disease management
- Use of rotary or any other suitable moutages with good aeration in the mounting area for quality cocoon harvest
- Harvesting of cocoons and marketing only on 5-6th day and not earlier

3. Residual toxicity of pesticides on mulberry cocoon production (02-06-2021):

Resource Person:

Dr. N. B. Jyothi, Scientist-E, KSSRDI, Bengaluru

- Pyriproxipen based pesticides have longer residual effect in the soil

- Silkworms fed on the leaf produced from the fields where pesticides (above) are used will be looking healthy, feed even for 9-10 days during 5th instar and they will not spin the cocoons
- To avoid long residual effect pesticides for soil application or for spraying on mulberry foliage
- Use bio-control agents to the extent possible for mulberry pest management

4. Strategies for Production of Quality Cocoon and Raw Silk (12-06-2021):

a. Enhancing commercial cocoon quality and its marketing strategies

Resource Persons:

Dr. C. S. Gururaj, Scientist-F (Retd) KSSRDI, Bengaluru

Sri. Chandregowda, sericulture farmer, Uragampet, KGF,

b. How to produce internationally gradable raw silk?

Resource Persons:

Dr. Subhas V. Nayak, Director, CSTRI, Bengaluru

Sri. Muhammed Muheeb Pasha, President, Silk Reelers Welfare Association, Ramanagara

- Maintenance of spinning environment temperature (25°C) and humidity (50-60%)
- Suitable mountages like rotary or KSSRDI ribbon type
- Cocoon harvesting on 6th day and cocoon sorting
- Cocoon grading and quality based price fixation
- Use of suitable improved machines for reeling

SAI Extends a Hearty Welcome

Silk Association of India is confident that the dynamic leadership and guidance of

Hon'ble Chief Minister

Sri Basavaraj S. Bommai

and

Hon'ble Minister for Sericulture

Sri K.C. Narayana Gowda

would lead Sericulture Industry of Karnataka to a faster growth path and make its future glorious.

Meeting with the Director of Sericulture, Tamilnadu

SAI team led by President Sri V.Balasubramanian with Sri M.Ramachandra Gowda, Secretary, Dr.B.S.Angadi, Director, Dr. E.Muniraju, Joint Secretary and Dr.H.K.Basavaraja, Director, visited Salem and discussed with Dr. Vinay, Director, Department of Sericulture about the proposed externally aided sericulture project on 11-04-2021.

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