Sericulture

SERICUTURE INTRODUCTION

- Sericulture is the cultivation of silk through rearing of silkworm.
- It is an agro based industry.
- It involves the raising of food plants for silkworm rearing of silkworm for production of cocoons, reeling and spinning of cocoon for production of yarn etc. for value added benefits such as processing and weaving.
- Sericulture also includes the practical aspects such as increasing productivity of land as well As labour, stabilization of cocoon production, improvement of silk fibre, fabric and generating Profitable income for rural poor people.
- Silk is an animal protein fibre secreted (produced) by the silk worm larva for spinning of the cocoon.
- This cocoon provides a protective shell (shelter)forthesoftanddelicatecaterpillartopass thepupalstageinsideitandmetamorphoseintoanimago(moth).
- Silkfibreisobtainedfromthesilkcocoons.

AccordingtotheChineserecords,thediscoveryofsilkproductionfromB.morioccurred about2700BC.

ItisbelievedthatempressLiezuwasaskedbyemperorHuang-titofindthecauseof damagedmulberryleavesontreesintheirgarden.

Theempressfoundwhitewormseatingtheleaves.

Shenoticedthattheywerealsoshinycocoonsaroundthemselves.

Acocoondroppedinhercupofteaandsilkythreadsseparatedfromthecocoon.

SilkindustrybeganinChinawherethesourceofsilkwaskeptasecretformorethan2000 years.

Aftersometime,Chinalosttheirmonopolyinsilkproduction,sericulturereachedJapan throughKoreaandthentoothercountries.

SericulturehasbeengrowinginIndiaasanagro-basedindustryplayingavitalroleinthe improvementofruraleconomy.

SCOPEOFSERICULTURE

Sericultureisanagrobasedindustrywhichplaysasignificantroleintheruraleconomyof India.

Itincludesallactivitiesrelatedtothesilkwormrearing,mulberrycultivationandevenpostcocoon technology.

IndiaandChinaarethetwomainproducersofsilkwithmorethan60%oftheworld'sannualproduction

Thepracticeofsericultureisbeneficialtotheruralpopulationinmanyways.

HighEmploymentPotential:Itisasourceofprovidingemployment.

Thissectoremploysonemanthroughouttheyearforproducingevery3.07kgofsilkproduced andusedinhandlooms.Thispotentialisveryhighandnootherindustrygeneratesthiskindof employment,especiallyinruralareas.

Sericultureispractisedasatoolforruralreconstruction.

ImportantAgro-basedEnterpriseAddingValueinVillages:About57% ofthegrossvalueofthefinalproductintheindustry(silkfabrics)flowsbackto thecocoongrowers.

LowGestation,LowInvestmentandHighReturns: Mulberrytakesonlysixmonthstogrowforcommencementofsilkwormrearing. AninvestmentofonlyRs.12,000to15,000issufficienttoundertakemulberrycultivationandsilkworm rearinginoneacreofirrigatedland.

Byadoptingrecommendedpackageofpractices,amulberryfarmercanattainnetincomelevelsupto Rs.30,000peracreperannum.

WomenFriendlyOccupation:Sericultureactivitiesstartingfrommulberrygardenmanagement,leaf harvestingandsilkwormrearingaremoreeffectivelytakenupbywomen.

Eventhepost-cocoonactivitieslikesilkreeling,twistingandweavingarelargelysupportedbythem.Thus, womenconstituteover60%ofthoseemployedinsericultureindustry.

IdealProgrammeforWeakerSectionsoftheSociety:Sericulturecanbepractisedevenwithverylowla nd holding(0.75acreofmulberrygardenandsilkwormrearingcansupportafamilyofthreewithouthiring labour).

Eco-friendlyActivity:Asaperennialcropwithgoodfoliage,Oneacreofmulberrycultivationandroot-spread,

mulberryprovidesgreencoverthroughouttheyear.Wastesgenerated

contributestosoilconservation.outofonehectaremulberrycultivation

Beingalabourintensiveandpredominantlyagro-basedactivity,smoke-emittingmachineryis

notinvolved.

Developmentalprogrammesinitiatedformulberryplantationaremainlyinuplandareas,vacantlands, hill

slopeswhereun-usedcultivablelandismadeproductiveandalsoinwatershedareasduetoitsdeep-rooted

perennialnature.

Inanagriculture-dominatedcountrylikeIndia,itisquiteimportanttoknowwhy

sericultureisgettingimportanceinthegovernmentplans.Thenexttwoparagraphs

willletyouknowaboutthesame.

Sericultureassumedimportanceinthesocioeconomicstructureofthedevelopingcountriesasitcouldbe

practisedduringthe

freetimeofthefarmerwhileraisingothercrops.Thus,itismoresuitabletowomen

whocanrearsilkwormsinthehousealongsidetheirhousework.

Givesgoodretumsatthefamilylevel.

Couldbestartedwithlowinvestment.

Couldbepractisedwithminimumtechnicalskills

Mostofthesilkwormrearingactivitiesarenotcontinuousandareconfinedto

theindoors

Providesemploymentatthedoorstep.

Providesincomeatshortintervalsthroughouttheyear.

Moresuitableforsmallandmarginalfarmholdings.

Shortgestationperiodandlongstandingcrop.

Involvesfamilyandunemployedyouth.

Existingmarketdemandforthefinalproduct.

Providesrawmaterialforhandloomsandpowerlooms,thussupportingtheweaversandothersupporti
ng

sectorsfortheirlivelihood.

Helpstoearnforeignexchangeandsavesexpenditureonimports

Supportsruraldevelopmentschemesasitemploysrurallabour.

Preventsmigrationofworkingruralmass,thusminimizingtheurbanizationproblems.

Providesrawmaterialsforothersubsidiaryenterprises.

Hasscopeforbyproductsutilizationforvalueaddition.

DISEASESOFMULBERRY

Leafyieldfrommulberrybecomesconsiderablyreducedwhentheplantisattackedbydiseases

andpests.Mulberrydiseasesmaybeinfectiousandnon-infectious.

Infectiousdiseasesarecausedbypathogens.Non-infectiousdiseasesarethosethataredueto

certaindeficienciesinnutrientsessentialtotheplant.Infectiousdiseasesareclassifiedinto fungal,bacterial,viralandnematodeformthecausativeorganism.

1.FungalDiseases:-Dependinguponthepartoftheplantaffected,fungaldiseasesaredivided into:1)root,2)shoot,3)leafdiseases.

A)FungalRootDiseases:-Therearethreefungalrootdiseasesofmulberry,allofthembringing abouttherottingoftherootsandhenceknownasrootrots.Theseareonlykillerdiseasesof mulberry.Theystartexpressingsuddenly.Witheringofleavesfollowedbydefoliationandoften foundsuddenlyinpatchesinfields.Theaffectedplantsdryupanddie.

B)MulberryTrunkRot(StemRotorHeartRot):-Therottingofthestemisduetothedestruction ofthestembythefungus.Theheartwoodofthetwigorbranchisdestroyedbythefungal growth.Thedryingandrottingofthetwigsandbranchesarethesymptomsoffungalattack resultinginthedeathoftheplant.

C)FungalLeafDiseases(PowderyMildewDisease):-Thediseaseismostcommonintherainy orpostrainyseason.Itcanbeseentobeaffectingthemulberryplantsfrom August to December.Intheinitialstageswhitepowderypatchesappearontheventralsurfaceandinthe advancedstages,theentireleafiscoveredwiththemandtheselaterturnyellowish-brownto blackincolour.Affectedleavesbecomedry,leatheryandfalloff.

2.BacterialDiseases:-a)LeafBlightDiseases:-Small,watersoakedirregularspotsappearon thelowermarginsoftheleavesandgrowbiggerandchangecolourtobrownwithayellow margin;theyspreadtotheuppersidealso.Theaffectedyoungleavesbecomewrinkled,

distortedandcurloutwards.Theaffectedleavesfalloffprematurely

b)BacterialRotDiseases:-Thebacteriaattackthebaseofthetwigsandformawhitishcolonyall around,usuallyatthegroundlevel.Asthelesionspreadsencirclingthetwig,thetissuesrot, leaveswitherandtwigsbreakoff.Theshapeofthestemandtheleafisdistortedfromthe bacteriagrowingonthem;tissuesrotandgrowthisaffected.

3)Viraldiseases:-knownasMosaicvirusdisease.Symptomsincludecurlingofleaves, distortionofleavesandplantdiesinheavyinfectionControlmeasures:-Recommendedcultural practicesliketilling,levelling,spacingetc.aretobefollowed.Overfertilizing,especiallywith nitrogenfertilizers,istobeavoided.Thediseasedplants/plantpartsaretoberemovedand burnt.Thesoilistobetreatedwithlimenitrogen(calciumcyanamide).

4)DeficiencyDiseases:-Deficiencyofbothmacroandmicronutrientscancausediseases. Symptomsassociatedwiththedeficiencyofeachnutrientaredifferentandcanberecognized easilyandcorrectedbyapplyingthespecificfertilizerstothesoil.

TYPESOFSILKS

a)Mulberrysilk:Bombyxmorri-feedsonmulberryleaves---Domesticatedform-----produces reelablesilk—cocoonsareusedbeforetheemergenceofmoth—producesmulberrysilkorfinest silk.

b)Erisilk:SamiaCynthiaricini-feedsoncastorleaves—domesticatedspecies—silkthreadsare

notcontinuous—cocoonsareusedaftertheemergenceofmoth—Soitisalsoknownasahimsa silk-–-Produceserisilkorarrindisilk.ItisfoundinAssam,Orissa&WestBengal.

c)Tassarsilkmoth:AntheraeaSp—feedsonleavesof,--Oak,Sal,Figetc.—Partially domesticatedspecies--producereelablesilk—cocoonsareverylargehavingthesizeofhen's egg—cocoonsarecollectedbeforetheemergenceofmoth.ItisfoundinBihar,Orissa,Madhya Pradesh.ItproducesTassarsilkorTassaksilk.

d)Mugasilk:Antheraeaassamensis-Itfeedsonleavesofwildtrees—itisnon domesticated—foundintheforestsofAssam—itproducesnonreelablesilk—silkproducedby themisknownasMugasilk

LifeCycleofsilkInsect(Bombyxmori)

Lifecycleconsistsofegg,larva,pupaandadult.

Adult:Theadultmothiswhitishincolour,25mmlongwith40to50mmwingspan.The femaleislargerthanthemale.Thebodyhasthreedivisions—headwithapairofeyesandapair ofantennae,thoraxwiththreepairsoflegsandtwopairsofwings,andonelargeabdomen.

Egg:Immediatelyafterthefemalestartslayingeggsonmulberryleaves.Theeggsare ovalandcoveredbyahard,smoothchitinoidshell.Atabout24°Camothlays300to500eggs within24hours.

Infavourabletemperaturethelarvaehatchoutwithin10to11days.

Larva:Anewlyhatchedlarvaisabout3mmlong.Thecylindricalbodyiscoveredwitha

chitinousskinanddividedinto13(or14)segments,withaheadattheanteriorendandacaudal hornneartheposteriorendofthebody.

Ithasthreepairsofthoracic,fourpairsofabdominalandapairofcaudallegs.

Thelarvagoestodormancyforfourtimes.Thesearecalled1st,2nd,3rdand4th‘sleeps.’ Each‘sleep’isfollowedbyecdysis.Thepartoflifeinbetweenhatchingandfirstecdysisis 1stInstar,andbetweenthefirstandsecondecdysisthe2ndInstarandsoon.

Towardstheendof5thstage,thelarvaismatureandstartsspinningcocoon.Thelarvalage is about20days.

Thefirstinstar(newlyhatchedlarva)isavoraciouseater,andisfedwithfinelycut,young mulberryleaves.Advancelarvaearefedwithmaturedandentireleaves.

The1stinstareatsforthreedays,stopseatingandmoultsto2ndinstar.The2ndinstareatsfor 2½daysandmoultsto3rdinstar.Aftereatingforthreedaysthe3rdinstarmoultsto4thinstar. The5thinstarisformedaftereatingfor4days.The5thinstareatsforeightdays,ceasestoeat andstartsspinningsilkarounditfromoutsidetoinside. TheprotectiveCoveringiscalled co-coonwhichisformedbyanunbrokensilkthread400to1,500metres. Acaterpillarlarva takesabout4daystocompleteacocoonandthenturnstoacompletelyimmobilelarva,the pupa. Thepupaistransformedintoafullgrownadultorimagoaftertendays. Theimago secretesafluidwhichdissolvesthecocoonatoneendandtheadultemergesthroughit.

Silkwormdiseasesandpestsofsilkworm

Themulberrysilkwormissusceptibletovariousdiseasesandisattackedbyparasitesandpests.

Varioustypesofsilkwormdiseasesoflarvaearecausedbyvirus,bacteria,fungusandprotozoa.

Thesediseasesoflarvaecausegreattroubleandlosstothesilkworms.

Soeachandeveryofthesilkwormdiseasesaretobetreatedseriously,otherwisecancreateepidemic.

Therearefourmajordiseasesthatarecausedbyparasitesandthesediseasesare:

(i) Pebrine

(ii) Flacherie

(iii)Muscardine

(iv)Grasserie

PEBRINE:Itisadangerousdiseasetothesilkwormsandthecausativeorganismisthe*_Nosema bombycis*_belongingtothephylumprotozoa.

Duringtheyear1865-70,thisdiseaseisfirstdiagnosedbythegreatBacteriologistLouisPasteur.

Thissilkwormdiseaseistransmittedthroughtheeggofthemothersilkwormandalsothroughingestion ofcontaminatedfood.

SymptomsOfPebrine:

(i)Infectedeggsarelackingadhesivegumandsotheyareeasilydetachedfromthecardboard.

(ii) Thelarvaebecomesluggishanddull.

(iii) Theyhavepoorappetiteandstopfeeding.

(iv)Thelarvaeinarearingtrayareofvarioussizesduetounequalgrowth.

(v)Infectedlarvaearelackinglusture.

(vi)Intheadvancedstageofthedisease,thereareirregularblackspotsaspeppergrainsonthebodyofthe larvae.Sothediseaseisnamedaspebrine.

PreventionAndControlOfPebrine:

(i)Afterlayingofeggsthefemalemothiscrushedandthefluidofthemothisexaminedunderthe microscope;ifthesporesoftheNosernabombysisareovservedinthefluidthenalltheeggsaretobe destroyedtocontrolthesesilkwormdiseases.

(ii)Diseasefreeeggsaredippedina2%formalinsolutionforfewminutesandthenwashedinrunning waterforrearing.

(iv) Disinfectionofrearingroom,frequentinspectionoflarvaeintherearingtrayanddestructionof diseasedlarvaearethegeneralpreventivemeasures.

FLACHERIE:

*Causativeagent:*Differentpathogenicbacteriaviz.,Streptococcussp./Staphylococcussp./orin combinationofbacteriaandviruses.

*Transmission:*Silkwormgetsinfectedbyeatingcontaminatedmulberryleaf.Deaddiseasedsilkwo rm,its

faecalmatter,gutjuice,bodyfluidarethesourcesofpathogencontamination.Theinfectioncanalsotake s

placethroughinjuries/cuts/wounds.

SymptomsOfFlacheria:

Flacherieinfectedsilkworm

Flacherieinfectedsilkworm

(i)Inthiscasethereislossofappetiteinthelarvae.

(ii)Thelarvaebecomesluggishandgrowslowly.

(iii)Theskinoflarvaebecomesinelasticandsofteningofbodytakeplace.

(iv)Intheadvancestageofthedisease,thelarvaevomitliquidmaterialandevacuateloosebowel.

(v) Thelarvaebecomemotionless,discoloredandflaccid.

(vi) Thebodybecomesblackandthendeathoccurs.

PreventionAndControlOfFlacheria:

(i)Thediseasedsilkwormsshouldbeisolatedfromtherearingtrayandthendestroyed.

(ii)Maintainnormaltemperature,humidityandventilationoftherearingroom,supplyhealthyandgoodleaf

asfood,avoidoverfeeding,avoidovercrowdingintherearingroometc.arenecessarytopreventsuch silkwormdiseases.

MUSCARDINE:Thesesilkwormdiseasesarecausedbyafungusknownas*Beuveriabassiana.*

Transmission

Theinfectionstartswhenconidiacomeincontactwithsilkwormbody.Mummifiedsilkworms, contaminatedrearinghouseandappliancesaresourcesofinfection

*SymptomsOfMuscardine:

(i)Insuchinfectionthediseasedlarvalosesappetiteandasaresultitbecomessluggish.

(ii)Thebodyofthelarvaebecomesstiff.

(iii)Thebodyiscoveredwithwhitepowderlikematerial.

(iv)Thelarvaultimatelybecomesdeadandappearslikeachalkywhitestick.

PreventionAndControlOfMuscardine:

(i)Theinfectedlarvaeareremovedanddestroyed.

(ii)Goodventilationandnormalhumidityaretobemaintainedintherearingroom.

GRASSERIE:Thisdiseaseiscausedbya*virus.Bobyxmorinucleopolyhidrovirus*

Transmission

Silkwormgetsinfectedwhenitfeedoncontaminatedmulberryleaves.

Themilkywhitefluidreleasedbythegrasserielarvae,contaminatedsilkwormrearinghouseand

appliancesarethesourcesofinfection.

SymptomsOfGrasserie:

(i)Insuchcaseofinfectionthelarvaeloseitsappetiteandbecomeyellow.

(ii)Thebodybecomesswollenandshiny.

(iii)Thebloodofthelarvaebecomesturbidlikepusandwhentheskinisbroken,milkypusflowsoutwhic
h

isknownasjaundiceofthesilkworm.

PreventionAndControlOfGrasserie:

(i)Thediseasedlarvaeshouldisolatedfromtherearingtrayandsubsequentlythelarvae

(ii)Suitableleaves,properventilationandspacingareselectedfortherearingofsilkworm.

ESTSOFSILKWORM

A)OneimportantpestofsilkwormistheUzifly.Thefemalesearchesforalepidopteranlarvaofsuitable sizeforoviposition.Theeggsarelaidsinglyandstuckfirmlyontheintersegmentalmembraneoramong thebristleswithagluesecretedbyitsaccessoryglands.Iftheeggsaredepositedontheearlyinstarlarva, Itpierceintothebodyofwormandthesilkwormdiesbeforepupation.Iftheyarelaidonalatelarva,the larvamayspinanormalcocoonandevenpupate.Buttheuzimaggotscomeoutofthepupaandpierce throughthecocoon.Asaresult,thesilkwormpupadiesandthecocooncannotbereeled.

B)DermestidBeetles:-
ElevenspeciesofDermestidshavebeenrecordedaspestsofsilkworm.Theypierce throughthecocoonbyfeedingonthemandeatthepupainside.Theyareparticularlyattractedbythesmel l

ofstifledcocoonsandarecommonlyfoundinthestoragechamberofreelingunits.Thelarvaeandadult feedonstifledcocoon,piercethemandmakethemunreelable.

C)Mite:-Miteisanectoparasite.Thefemalemiteattachesitselftosilkworm larvaeandpupae,draw nourishmentfromitsbody.Italsoproducesatoxinwhichkillsthehost.

D)Ants:-
Antsattacksilkworminthetrays,thespinninglarvaeandcocoonsonthemountages.Useanant wellbelowtherearingstandandmountage.

E)Nematodes:Attackssilkworm,particularlytheyoungones.Itpenetratesinto thebodyandkillsthemoff.

F)Lizards,Rats,SquirrelsandBirds:Thesearesomeofthelargervertebrates

whichpickupthelarvaeandcocoon.Itcanbepreventedbyputtingwiremeshon allthewindows.

Silkwormrearing

Sevenmainstepsinvolvedinrearingprocessofsilkworm*.Thestepsare:

1.Disinfection

2.Brushing

3.FeedingtheLarvae

4.Spacing

5.BedCleaning

6.CaringduringMoulting7.Mounting.

1 *Disinfection:*

Itisthemostimportantopera-tionthattobecarriedoutpriortothecommencementof rearing.Disinfectionofeverythingincludingrear-ingplacesiscarriedoutbyphysical,chemical orradiationmethods.

(i)Physicalmethods:Thesearecheap,con-venientandeasytooperate,e.g.

(a)Sunlight:Dryingofrearingappliancesinsunlightcancausedisinfection.However,sundrying cannotbecarriedoutduringwinterandrainyseasons,andsomeappliancesarelikelytobe damagedbyexposuretosunlight,

(b)Steam:Disinfectionbysteamingmaybeusedforrearingroomandsomeappliances(not

madeofbambooorwood).However,initialcostforinstallingthesteamingapparatuslikeboiler andpipelineishigh.

(c)Hotair:Itisalsoagoodsterilisingmethodbutcannotbeusedinroutinesericulturebecause ofitsproductioncost.

(ii)Chemicalmethod:Themostcommonlyuseddisinfectionmethodinsericultureischemical method.Chemicalsgenerallyusedarenon-toxictomanandanimals,havebroadspectrum activity,stableandreadilymixablewithwaterandfairincost.

Mostfrequentlyusedchemicalsincludechlorineaschloramine,iodineasiodophores,phenolas cresolandhexachlorophene,formaldehydeasformalin(2%),bleachingpowder,etc.Theseare usedassprayorfumigant.

2 *Brushing:Brushingistheseparationofnewlyhatchedlarvaefromtheireggshellsand transferringthemtorearingtraysfromtheeggcards.Thenewlyhatchedlarvaeareblack,bristly andcalledants.

Brushingisusuallystartsat10amwhenpeakhatch-ingoccurs.Brushingcanbedoneby variousways:

(a)Brushingfromlooseeggs:

(b)Brushingfromeggcards:

(i)Feather:Heretheeggcardisheldverticallyabovefreshlypreparedrearingbedandthenby gentlestrokesofafeather,thelarvaearepulledoutfromthecardontherearingbed.

How-ever,thismethodislittlebitcrudeandmaycausesomeinjurytothelarvae.

(ii)Husk:Herepowderedhuskissprinkledovernewlyhatchedlarvaeontheeggcard.Then freshlycutmulberryleavesaresprinkledoverthecentreofhusk.Thelarvaecrawlupthehusk toreachtheleaves.Aftersometimes,thelarvaearebrushedfromhuskbymeansofafeather ontherearingbed.

3 *FeedingtheLarvae:*

Boththequalityandsizeofthecocoonsdependmainlyonthequalityofmulberryleavesfedby larvaeduringrearing.Afteralittlepractice,theamountofleavesthattobegivenperfeedingto fulfilltheappetiteoftheworms,isadjusted.Theamountoffoodgivenalsodependsonraces andvoltinismofthemoths.

Ofthetotalingestionduringentirelarvaldevelopment,nearly85%offoodistakenduringIVth andVthinstarstages.

Duringfeeding,generallyagapof2hoursisgivenbeforeandaftereachmoulting.Young wormsarealwaysfedwithtenderleaveswhilelatestagesaregivenmaturemulberryleaves. Toenablethelarvaetofeedeasily,youngwormshavetobegivenchoppedleavesbutfor matureworms,fullleavesoryoungbranchesorshootsmaybegiven.

4 *Spacing:*

Thesilkwormsgrowveryrapidlyfromagetoageandincreasemanytimestheirweightandsize fromthepreviousinstar.Thetotalincreaseinweightfromhatchingtotheendof Vthinstaris

about7,000to10,000times.

Crowdedsituationinrearingtraysresultsinincreasedhumidity,heat,fermentationoflitter,all ofwhichwillinturncauseunderdevelopmentoflarvae,wastageoffeedingleafandunhygienic condition.Toprovidemoreandadequatespaceforthegrowingworm,therearingspacehasto beextendedateachstageandthisiscalledspacing.

Spacingisusuallydonealongwithbedcleaningandisgivenonceaday.

5 *BedCleaning:Therearingtrayofsilkwormsaccumulatessomeunconsumedleaves

aftereachfeeding,exuviaeaftermoulting,excreta,deadordiseasedlarvae,etc.Alltheseifnot

cleaned,combinetoformathickanddamplitterwhichpromotesthegrowthofdifferentmicro-organisms,generationofheatandinjuriousgasesanddepletionofoxygen.

Hence,itisverynecessarytoremovethelitterperio-dicallyandtheprocessofitsremovalis calledbedcleaning.

Bedcleaningcanbedonebyusingpaddyhusk,strawandbedcleaningnet.During1stinstar, bedcleaningshouldbedoneonceduringpermoulting,during2ndinstartwice,onceaftermoult andbeforenextmoult.

During3rdinstarthrice,i.e.aftermoult,beforenextmoultandonceinthemiddle.During4th and5thinstarsonceinadayincaseofshelfrearing.However,incaseoffloororshootrearing,

bedcleaningshouldbedoneonceineachinstar.

6 *CaringduringMoulting*:Incommercialracesofsilkworm,moultingoccursfourtimes, lastingfor15-30hours.Duringthistime,thewormdoesnottakeanyfood,wrigglesoutofthe oldskinandcomesoutwithanew,softskin.

Caretakenduringmoultingincludesstoppingandresumingfeedingatappropriatetimeto ensureuniformgrowth,keepingthebeddryanddisinfectedeitherbydusitngReshamKeed Oushad(RKO),formulatedbyCSRandTI,Mysoreorbysprayingabex,formulatedby Berhampur.

Besidesdisinfectingaction,RKOcanreducegrasserieindifferentseasonsandcanincrease growthrateoflarvaeleadingtoimprovedcocoonquality.Labexhasantimuscardineeffectand caninhibitearlymoultersfromresumingfeedingleadingtouniformgrowth.

6 *Mounting:Mountingistheprocessoftransferringtheripewormstothemountages.On themountage,theripewormsexudesilk,spinthecocoonarounditselfandtransformedinto thepupainsideit.Thepupaaftermetamorphosingintoadultmothcomesoutbypiercingopen thecocoon.

Theaimofsericultureistorearthesilkwormprovidingthemoptimumconditionsand mountagessothattheycanspingoodcocoonwithhighandbestsilkcontent.

Mountingisdonebyfollowingmethods:

(i)Handpicking:Ripewormsarecollectedinatrayonebyonebyhandandthentransferredto themountages.Thoughsomewormsmaybeinjuredwhilepickingandhandling,butbythis

method,onlyripewormscanbepickedanddistributedmoreuniformlyinthemountages.

(ii)Simultaneousmounting:

Inthismethod,anumberofmaturelarvaeiscollectedsimultaneouslyandtransferredtothe mountage.Here,mature,immatureandover-maturewormsaremountedtogether;hence,

cocoonformedbythemmaynotbeuniform.

(iii)Netmethod:Intherearingtray,whenwormsareripen,strawropenets/rushnetsor cleaningnetsarespreadovertherearingbedsandleftforsometime.Ripewormscrawlalone onthenetswhileunripewormscontinuefeeding.Thenetswithripewormsarethenshakenon themountagestotransferthemwithouttouchingbyhand.

(iv)Branchmethod:Heresmallbranchesofmulberryarespreadovertherearingbed.Ripe wormscrawlingoverthemarethenshakenoffonthemountages.Besidesbranch,driedweeds (Russia)orcutstraw(Japan)canalsobeusedfortransferringtheripewormstomountages.

Numberofripewormspermountageisveryimportant.Ingeneral,oneripewormrequiresan areathatisthesquareofitsbodylengthforspinningitscocoon.

Toowidespacingmaycausewastageofsilkforspinningthepreliminaryweb.Again,tooclose spacingmayresultinformationofdoublecocoon(whicharenotreelable),stainingofcocoons withexcretaofthewormsandalsoformationofdampcocoons.Theoptimumdensityfor Chandrikais50wormsper0.1m2.

Precautionstobetakenduringmounting:

(i)Onlyripewormsshouldbemounted.Unripewormsspoilothercocoonswiththeirexcreta whileoverripewormshastilyspincocoonswhicharemalformed,flattened,stickyandinferior.

(ii)Anoptimumtemperature(24°C)shouldbemaintainedinspinningplace.Toolow temperaturecausesdelayedformationofcocoons,andaffectscolour,lustreandtextureofthe silk.Toohightemperatureresultsintheformationofdeformedcocoonswiththickfilament.

(iii)Theidealhumidityforspinningis60-70%.Ventilationisneededtodrythewetsilkintofirm cocoonandtoevaporatethewaterorexcretareleasedbythewormsduringspinning.

(iv)Themountagesshouldbedisinfectedbeforeandafteruse.

Thespinningwormsshouldnotbedisturbedwhichotherwisewouldresultsuspensionof spinningandbreakingofthread.

UsesofSilk

1.Silkissoftsmooth,lustrousandholdsaprestigiousplaceamongtextile fibresandknownas'QueenofTextiles'.

2.Silkisusedmainlyinthetextileindustryformanufacturinggarments,especiallyinthemaking ofwomen’shosiery.

3.Duetothehighinvestmentrequiredinthecollectionandproductionofsilk,useofsilktextiles hasbecomeratherastatussymbol.

4.Silkisalsousedinthemanufactureofcartridgebags,telephonecableinsulations,fordyeing,

screenprintingetc.

5.Rawsilkisusedforclothingsuchasshirts,suits,ties,blouseslingerie,pajamas,jackets,

6.HandspunmulberrysilkusedformakingcomfortersandsleepingvarietyOtherbags.fabric materialslikedupions,plainsilk,deluxe,satin,chiffon,chinnons,

crepe,broacadesaremadefrommulberrysilk.

7.Carpet,furnishing,curtains,draperies,cushionandsofacoverswallcovershanging.Knitted materialsfromsilkfibres

8.Thesilkglandsaredissectedoutandputinwarmwaterandpulledattwoendsto yieldafibreofuniformthickness.Thisproteinisautoabsorbableandneednotberemoveed afterwoundhealing.

9.Silkgraftshavebeenusedsuccessfullytoreplacecutarteries.

10.Silkwormcanberearedinlaboratoryforgeneticandbiotechnologystudies.

11.Reelingwaste,badcocoonsareusedtomakespunsilkfabrics.

12.Articlesmadefromwastesilkalsohaveagoodexportmarket.

13.Silkyarnisusedaspencilpackagematerialinindustryandformakingtalcumpowderpuffs.

14.InFrance22-24deniersilkisusedintyremanufacturingtohavealonger

lifespanthanrubbertyresinbicycletires,artillerygunpowder

15.Parachutesaremadefroom13-15deniersilkfiber.TheseparachuteswereusedinWorld War-l.

16.Silkisusedasrawmaterialforpreparingsound-freegearsformakingprecisionmachinery.

Sericulture in simple words is silk production mechanism by an insect. At the commercial level or the production of silk from silkworm by rearing practises on a commercial scale is sericulture. In India major silk-producing centres are in Assam, Punjab, Kashmir and Karnataka. Silk production in India is 2969 turn per year. India ranks 3rd in the production of silk. Mysore, Karnataka is the largest silk product

Definition of Sericulture

The process of breeding, growing, management of silkworms to get pure raw silk is sericulture. There are many different species of silkworms found. For example Mulberry silkworm, airy silkworm, giant silkworm etcetera. The insect which produces silk is called silkworm.

History of Silk

The production of silk originates from China. At that time silk was not only in use for clothing but also for a number of other applications. The colour of silkworm was an important guide of social classes during the tang dynasty.

The Arabs also begin to manufacture silk at the same time. As a result of the spread of sericulture, Chinese silk exports became less important, although they still maintained dominance over the luxury silk market. During the 16th century France joint Italy in developing a successful silk trade, do the efforts of most other nation to develop a silk industry of their own were unsuccessful.

Process of Sericulture

To obtain silk mood are reared and their cocoons are collected to get silk thread.

- **Rearing of Silkworm**– Silkworm farmers buy eggs and raise then they kept these under suitable conditions. Then the eggs are warmed so that they can hatch. Then they let the caterpillars grow in that particular condition. Caterpillar eats Mulberry leaves. After this, they kept these caterpillars in the clean bamboo tray with mulberry leaves. The caterpillars move to a chamber to build a cocoon in that tray Also small drags are provided so cocoon get attached. And then silkworm spins the cocoon inside.
- **Processing Silk-** As the cocoon are acquired, they are kept under some or boiled so the silk fibre can be separated or reeling the silk process off taking out threats from the cocoon for use as silk. Silk fibre does obtain are drawn and rolled into threads.

Taxonomic position of Silkworm

Phylum- Arthropoda (jointed) incision Insecta

Subclass- pterygoid (have wings)

Division- Endopterygota (go through distinctive larval, pupal, and adult stages)

Order – Lepidoptera (4 large covered wings, bear distinctive marking, and larva that caterpillar)

Superfamily – Bombycoidae

Species- Mori

Species of Sericulture

More than 500 species of wild silkworms exists in the world, all do only a few are used to produce clothes. These 2 are as follows:

1. Bombycidae (Bombyx Mori)

Bombay Mori is popularly called The Chinese silkworm or Mulberry silk mood. It is well known for silk. Mori is caterpillars that are about 4 centimetres long, including their horned tail. They are buff coloured and have Brown lines on their whole body. It is a native species of China and is famous for silk in Japan, India, Korea, Italy etc. It feeds on Mulberry leaves so it is also called Mulberry silkworm. Also, it is one type of mono figures insect which continuously feed on the Mulberry leaves. Hence it is called Veracruz feeder. Bombyx Mori has several races and varieties.

The Life Cycle of Bombyx Mori

In silk moth the sexes are separate. The development includes a complicated metamorphosis. After fertilization, each female moth lays about 400 to 500 eggs. These eggs are placed in the cluster on the leaves of the Mulberry tree. The eggs are smaller, over and usually yellowish. The egg contains a good amount of yolk and is covered by a smooth hard shell. After laying the egg the female mode doesn't take any food and dies within 4 to 5 days. In the univoltine the may take a month because overwintering takes place in this stage but the multivoltine Broads come out after 10 to 15 days. From the egg hatches out lava called caterpillars. The larva of the silkworm is called Caterpillar larva.

The newly hatched larva is about 400 to 600 mm in length. It has a rough, wrinkled, hairless and yellowish or white worm-like body. The body of larva is the distinguished table into the prominent head, segmented thorax and abdomen. The abdomen consists of 10 segments of which first 9 are marked while the 10^{th} one is indistinct. The 3^{rd}, 4^{th}, 5^{th}, 6^{th} and 9^{th} abdominal segment bear ventrally appear of unjointed appendices. These are called prolegs. The larval life lasts for 23 weeks. During this. The larva moults 4 times. After each moult, the larva grows rapidly, a full-grown larva is about 800 centimetres long. A pair of long sac-like silk gland now develops into the lateral side of the body. These are modified salivary glands. The full-grown larva now stops feeding and hide in a corner under the leap.

Now it begins to secret the clear and sticky fluid of its celebrity glance through a narrow pour called spinneret situated on the hypopharynx. The sticky substance turns into a fine long and solid thread. The thread becomes wrapped around the body of the Caterpillar larva farming a complete covering called a cocoon. The cocoon formation takes about 2-3 Days. It serves a comfortable house for Caterpillar larva. The cocoon is a white or yellow thick Oval capsule which is slightly narrow in the middle. It is formed of a single long continuous thread pull stop the outer thread which is initially filament of the cocoon is irregular but the inner ones forming later the actual bed of the pupa.

2. Eri Silkworm

Eri silkworm is mainly reared on castor plant. The scientific name of Castor plant is Samia Cynthia Ricini. It produces silk which is white or brick red. It is polyphagous it means that it doesn’t include a single plant but can also feed in various plants. Castor is more prominent but Its cocoon is not continuous as compared to the Mulberry

silkworm. Its moth can emerge and pierced cocoon can be used. It’s male and female cocoon colour is Brown, black, green wings, white abdomen. In North India Brahmaputra, Hills of Meghalaya, Mizoram, Nagaland, Manipur, Arunachal Pradesh is famous for eri silkworm.