DISCUSSION

The North Eastern region of India is one of the 35 biodiversity hot spots declared in the world and occupies an important position in sericulture map of India due to its unique faunal and floral wealth. Four varieties of silk viz. Mulberry, Eri, Muga and Oak tasar are produced in N.E. region. Sericulture and silk weaving is the part and parcel of cultural heritage of the people of N. E. India. The oak tasar (*Antheraea proylei* **Jolly.**) silkworm fed on leaves of Oak tree *Quercus* species, is an important source of tasar silk, a rough coarse and nubby silk usually with natural shade of beige. The Oak tasar track extends from Jammu and Kashmir in West to Manipur in the East, Himachal Pradesh, Uttrakhand, Assam, Arunachal Pradesh, Meghalaya, Mizoram and Nagaland. The production of oak tasar raw silk 3.0-5.0 metric ton (2007-08 to2014-15 Table:2) and it is necessary to production of oak tasar silk to earning foreign exchange as well as creating employment generation in rural sector. A Little scientific input to add to its knowledge would open a new avenue for its improvement which will be help for upliftment of rural society.

Research Stations of Central Silk Board in the country are engaged in study relating to overall improvements the quality of silkworm and its host plant to increase raw silk productions, the microorganisms associated with the phylloplane and rhizoplane of Oak tasar host plants is yet to be recognized fully, in its role to improve the nutrition of the silkworms. The Fungi play a very important role in nutrient cycling and plant health development (Thorn, 1997; Bridge and Spooner, 2001). Many workers have studied the nutritional status of the leaves of host plants but the rhizosphere mycoflora of the host plants have not been taken care. Now it is a recognized fact that the fungal spores and mycelia spread over the leaf surface may contribute critically on the nutrition of the silkworms and the mycoflora present in the root surface or rhizosphere indirectly may influence it by improving the nutritional status of the host plants in the soil. The region surrounding and including plant root is of crucial importance for plant health and nutrition (Marschner, 1995).

The present investigation dealing with the rhizoplane and phylloplane of *Quercus serrata* and their role in growth and development of Oak tasar silkworm at Umrangso, Dima Hasao district of Assam has many limitations and therefore, it is not exhaustive, but, rather a prelude to opening new avenues of study relating to the mycoflora associated with rhizoplane and phylloplane of host plants of oak tasar silkworm and their role in critical nutrition of silkworm and thereby their growths, development of silkworm and raw silk production efficiency.

The physico-chemical characters of the soil of the investigation area (Table:17) shows that soil of the area is acidic in nature with high organic content in soil. Soil moisture stress has been found to enhance and decrease root exudation (Grayston *et al.,* 1996). Soil pH is one of the most important factors affecting soil fertility (Foth and Ellis, 1988) and the ideal soil for most plants is slightly acidic to neutral since in this state most of the compounds containing the plant nutrients have their most ideal solubility (Kellogg, 1998). Fungal population is most positively co-related with organic matter content in soil (Noverriza and Quinmio, 2004). The variable quantities of different nutrient level in soil during this investigation may probably be due to the use of manures, fertilizers and other cultural practices in the soil and indicates the fertility level of the soil.

The plant rhizosphere is dynamic environments in which many factors may be affect the structure and species composition of the microbial communities that colonize the roots. The microbial communities associated with the rhizosphere vary depending up on the plant species (Grayston *et al.*, 1998), soil type (Campbell *et al.*, 1997), and cultural practices (Lupwayi *et al.*, 1998). The notable findings from the present investigation of soil mycoflora of seedling (Table:12) and mature plants (Table:13,14) of *Quercus serrata* are that microbial population are higher in mature plants as compared to the seedling. Rhizosphere soil contained greater spectrum of fungal species than either rhizoplane or non rhizosphere soil. Root exudates they stimulate microbial activity selectively in rhizosphere and rhizoplane regions (Bansal and Mukkherji, 1996). Mali (1975) reported that increased fungal population in the rhizoplane of Coriander with increasing age. El-Amin and Saabadi (2007) reported that significant variation in total number of fungal colonies and percent abundance of fungal species in rhizosphere soil of Sugarcane, which is increased with plant age. They also reported that high occurrence of *Aspergillus, Rhizopus, Penicillum, Fusarium and Curvularia* from Sugarcane rhizosphere. The Rhizosphere contains lots of organic substrates which harbour a high count of microorganisms, especially fungi (Noveriza and Quimic, 2004). The soil organic content and as well as its acidic nature probably influenced the isolated population from the rhizosphere.

Most commonly the isolated fungi in both seedlings and mature plants during the investigation were *Aspergillus niger* and *Aspergillus flavus, Fusarium* sp, *Alternaria* sp, *Cladosporium* sp, *Trichoderma harzianum.* Abdel Hafez, (1982), reported that *Aspergillus niger, Aspergillus flavus* and *Fusarium solani* among the most frequently isolated fungi from the rhizosphere of *Tritichum vulgare* .Noveriza and Quimio (2004) also reported that *Aspergillus flavus* and *Aspergillus niger* most frequently from Black Pepper rhizosphere. *Aspergillus niger* was also found to be the most dominant species during this investigation. Domsch *et al.,* (1980) reported that *Aspergillus niger* was found in soils with pH range of 4-8. This study also shows similar result. The abundance of *Aspergillus* sp, during this investigation may be due to their high sporulating ability and tolerance for different physico-chemical conditions of the soil and also their ability to utilize the available nutrients more readily over other species.

Some of species like *Aureobasidium pullulans* showed seasonal appearance in matured plant during this investigation. *Curvularia* sp was common throughout the study in all soil in matured plants. *Fusarium solani* showed distinctive absence in non rhizosphere soil. The differing physical, chemical, and biological properties of the root associated soil, compared with those of the root free bulk soil, which are responsible for changes in microbial diversity and for increased numbers and activity of microorganisms in the rhizo sphere micro environment (Kennedy, 1998. Gams and Domsch (1969), Hawkworth (1991), Persiani *et al.,* (1998) the study of seasonal variation in soil fungi pointed out that fungal population differ from season to season in a particular soil (Rane and Gandhe; 2006). Bisset and Parkinson (1979) also indicated that the major sources of variation in micro-fungal species composition are attributable to differences among sites, which largely are determined by vegetation.

Soil fungi show marked periodically throughout the year, (Warcup, 1957) the maximum number of micro-fungi being present during winter and the rainy seasons. Microbial community seasonal maxima in the wet winter months and seasonal in dry summer month have been reported from Oak canopy soil compared with open grassland soil by Waldrop and Firestone (2006). Rane and Gandhe (2006) also reported that maximum diversity of during winter from Pal forest soil. In the present investigation also shows maximum fungal diversity during autumn season. The occurrence of different fungal species depends upon soil type, moisture content, mineral nutrients, and soil temperature (Vanvuurde and Schippers, 1980; Shukla *et al.*, 1989). Isolated fungal species were most common to both rhizosphere and non-rhizosphere expects a few species. A few researchers like Dwivedi (1966), Dkhar and Mishra (1987) they discussed seasonal variation of fungal population in some soil types and concluded that changes in soil, organic contents, water holding capacity, temperature and pH of the respective season are the probable factors associated with fungal population. According to Pandey and Palni (2007) they were observed that a concomitant decrease in the pH of the rhizosphere soil where ever an inhibitory effect on the rhizosphere microbes was observed. Shukla and Tripathi (2007) during their study in the distribution of micro-fungal communities in forest soil observed that the density of fungal propagules had a close inverse relationship with the pH of the soil which was the one of the most important point.

The fungal isolates during the present investigations most probably, have been influenced by the soil characters, like moisture content, pH of the soil, age of the plants, nature of exudates from the roots, and the status of nutrient availability, cultural practices in plantation, location of study area as well as environmental condition governing the seasons.

The biochemical constituents of the leaves of *Quercus serrata* from the study area show that, irrespective of seasons moisture content of leaves are more in spring season than autumn season in three different treatments-mature (Table:18-24.). Bhuyan (2002) observed that from different types of host plant of Muga, and (Pathak, 1988) in Eri food plants. Moisture content of the leaves in *Persea bombycina* has a direct bearing on the health of silkworm, and high moisture content in the leaves favourable effects on the palatability and availability of nutrients and serves as a criterion in estimating leaf quality (Parpiev, 1968).

Total carbohydrates content is high on mature leaves of *Quercus serrata* than semi-mature and tender leaves reported by (Sinha *et al.*, 1986, Pandey and Goel; 1991, Pandey; 1995, Ponnuvel *et al.*, 1996). Crude protein content was more in tender leaves of *Quercus serrata* than semi-mature and mature leaves which was found during the investigation. Higher leaf protein was found to be significant for better silk production (Verma and Kushwaha, 1970), Bhuyan, (2002), also observed that tender leaves contained more protein than mature leaves. Of som. It was also found that in present study the leaf moisture and crude protein more in Spring season which declining trend in the leaves of *Quercus serrata* in Autumn season(Table:18,19 and 20). It was also found that less carbohydrates in Spring season which increasing in Autumn season. Ponnuvel *et al.*,(1996) rerorted leaf moisture 69.49% and 67.03%,crude protein 10.17 %and 9.88%, carbohydrate 10.84% and 10.81% during March and April respectively.The Effective Rate of Rearing % was found higher in Spring season than Autumn season(Table:9)which was similar reported by Ponnuvel *et al.*,(1996) ERR 72.4%and 60.4% during March and April(Spring season) respectively. Pandey(1995) reported ERR 66.60% ,Raja Ram *et al.*,(1998)also reported ERR % of *A.proylei* **Jolly.**on *Q.semicarpifolia* of seven different morphotype range 54-81.4% in Spring season.

Eleven fungal species were isolated from the leaf surface of *Quercus serrata* (Table:10,11 and photo plate no. 2-5) the types of fungi which colonized the leaves at different stages of maturation, viz. Tender, semi-mature and mature leaves are more or less same. The species of *Aspergillus,* particularly *Aspergillus niger* was found to be the most dominant in the three stages of leaf growth during all the season. *Aspergillus fumigatus* was found co-dominant in lower surface of mature leaves in spring season and both leaf surface of tender and semi-mature leaves in autumn season. It was also found that *Alternaria alternata* co-dominant in both leaf surface of tender and semi-mature leaves and upper surface of mature leaves in spring season. Baruah *et al.*,(1998), Bhuyan (2002) reported dominance of *Aspergillus fumigatus* from three different host plants of Muga, viz. Som (*Machillus bombycina*) Soalu(*Litseae polyantha*) and Meejankari (*Litseae citrata*).They also reported that *Alternaria* sp , *Aspergillus fumigatus, Aspergilus flavus ,Aspergillus candidus, Curvularia* sp. *Mucor* sp,*Phoma* sp from the leaf surface of som plant. Gupta and Khube (1991) isolated from the oak leaf litter different fungal species were *Aspergillus flavus, Penicillum* sp, *Fusarium solani, Mucor hiemalis, Phoma humicola* etc.

The dominance of *Aspergillus* sp in all the seasons may be due to richness of *Aspergillus* species over *Quercus serrata* (Oak) plantation field and their ability to colonize the Phylloplane of Oak plants. *Aspergillus* sp dominance was also reported by Bhuyan (2002), Singh and Baruah (1979) and Mishra and Shukla (1989).

The fungal increased colonization of old leaves is due to super-infection of the leaves over time, air-borne inoculums (Suryanarayan and Thennarasan, 2004). Sharma (2004) has also reported that occurrence of some fungi in all stages of growth, while others with restricted representation in Sugarcane leaves.

According to De Jager *et al.,* (2001) reported that gradual increase of filamentous fungal and yeast densities from follicle stage, through flush and juvenile to mature leaf stage in Mango Phylloplane and the most common fungal genera isolated were *Cladosporium cladosporioides* and *Alternaria alternata.* They also reported that isolation of *Candia, Aspergillus, Colletotrichum, Curvularia, Drechslera, Nigrospora, Mucor, Penicillum* and *Rhizopus* along with many other filamentous fungi from Mango phylloplane. More fungal species were found in lower surface of leaves than upper surface of leaves of Oak leaves, and it's also observed more fungal species in mature leaves lower surface in autumn season than spring season. It may be due to the leaf surface anatomy, availability of nutrients, compatibility between the microbes present on the leaf surface and environmental factors like temperature, relative humidity around the phyllosphere, atmospheric precipitation, intensity of UV (ultra violet) radiation etc. Bhuyan (2002) also reported more fungal flora on the lower surface of Som leaves. The persistence of *Cladosporium* and *A.alternata* is ascribed to their excellent adaption to the Phylloplane (Dickinson, 1976). And Levetin and Dorsey (2006) also reported greater number of fungal colonies from the abaxial surface of *Quercus* and *Ulmus* leaves. Suryanaryanan and Thenarasan, (2004) have reported *Colletotrichum* sp and *Phyllostica* sp from *Plumeria rubra* leaves during the wet period. Das *et al.,* (2005) have reported *Colletotrichum gloeosporioides* as the casual organism of Leaf blight disease of *Persea bombycina* plants with peak in June-July and *Phyllosticta perseae* as causal organism of leaf spot disease of the same plant occurring from May to

August. Isolation of the two genera in healthy leaves of *Persea bombycina* may be due to abundance of their spore during rainy season or rain splash of the spores from the diseased leaves. *Phyllosticta perseae* was found during Spring to Rainy season and *Collototrichum gloeosporioides* was found from Spring to Autumn.

Qualitative and quantitative diversity of fungal species may be related mainly due to environmental factors, as well as cultural operation practiced in the plantation to suit Oak tasar silkworm rearing. During the Spring season effective rate rearing is higher than Autumn season may be due to presence of more *Aspergillus* sp abundance percent in Spring along with more leaf moisture and crude protein. Diem (1974) reported that presence of water on leaves was found necessary for the development of myco-flora, which is one of the most important factor. The reason for low diversity of fungi on the leaf surface during the rainy season, which is probably due to high precipitation in the area, due to which the fungal spores are washed out to the ground. In addition to nutrient level, growth and abundance of phylloplane fungi are also influenced by environmental conditions such as water availability, UV radition, and temperature (Breeze and Dix, 1981; Sundin 2002; Zak, 2002).

The occurrence of different fungal species during this investigation therefore may be attributed mainly to the local environment factors, leaf surface morphology, nutrient exudates of leaves, cultural practices like pruning to suit Oak tasar silkworm rearing in the farm, and more relative abundance of the reported fungi in the air over the plantation field etc. Eleven fungal species were isolated from air over the study area at Umrangso REC farm (Table: 15,16 and photo plate no: 2-6) *Aspergillus niger* was the most dominant species throughout the investigation. *Aspergillus* sp, was found to be the most predominant in air at Raipur (Tiwari and Sahu, 1988 and Sahu, 1998). Highest concentration of *Aspergillus* sp. was also observed from different plants of Aurangabad (Tilak and Sriivasulu, 1967), Raipur (Tiwari and Jadav, 2004). Basumatary *et al.,* (2002) reported isolation of *Alternaria* sp, *Aspergillus* sp, *Cladosporium* sp, *Fusarium* sp, *Helminthosporium* sp, *Mucor* sp, *Nigrospora* sp, *Penicillum* sp, *Rhizopus* sp, and *Torula* sp, from atmosphere of different environments from Goalpara District, Assam. Kamal and Singh (1974) reported *A.niger* as one of the *Aspergillus* sp , constantly occurring during all seasons of the year from sugarcane field at Gorakhpur (U.P.). Singh, (1981) reported prevalence of spores of *Aspergillus* sp, *Cladosporium* sp, *Alternaria* sp, and *Curvularia* sp. as most frequently isolated from Shillong atmosphere. In this investigation also *Aspergillus* sp. *Cladosporium* sp and *Alternaria* sp. has been isolated in both Spring and Autumn season. The dominance of *Aspergillus* sp in the both season during Spring and Autumn season in this investigation may be due to richness of *Aspergillus* sp. in the air over *Quercus serrata* plantation of Umrangso REC Farm. Last (1956 b), in his study of air spora within and above mildew infected cereal crops found higher population near ground. Similar observation is made in this study. The richness of isolated fungal species in the bottom layer may be due to nearness to the soil and lifting of dry soil particles from soil during different periods. Uddin (2005) from West Bengal, Pund and Tidke (2005) from Amravati reported that total fungal species increased in Autumn and Winter season. The atmosphere contains tremendous diversity of airborne spores with high concentration frequently occurring from spring through fall in temperature areas of the world (Gregory, 1973; Levetin, 1995)

According to Huang *et al.*,(2002) the airborne fungi were higher in winter than other seasons in the municipal landfill sites of Taiwan and ascribed it to the geographic characteristics of the sampling area. Fang *et al.*, (2005) reported that a high frequency of airborne fungi in regions with high vegetation coverage in summer in Beijing and also mentioned that, most of the airborne fungal spores came from vegetation rather than soil. Hariri *et al.*, (1978) reported that the most prevalent airborne fungi in Ahvaz-Iran were *Penicillum, Alternaria* and *Aspergillus.* Abdel-Hafez (1984) showed that the maximum airborne fungi were in Winter and minimum in the Summer. A few more fungal diversity in air, during Autumn than Spring season in this investigation can also be also be attributed to various meteorological factors particularly moisture content of the atmosphere. Minimum fungal diversity during Rainy season may be due to high precipitation recorded by several workers.

Meteorological data recorded in the area during rearing period s of Umrangso. The rearing performance of Oak tasar silkworm reared during Spring (March-April) and Autumn (September-October) season. The effective rate of rearing (ERR%)and SR% was more in Spring season than Autumn season. It was observed that ERR% was very much influence of the environmental conditions prevailing over the season and optimum conditions prevail over the seasons. The analyzed data on the economic traits of Oak tasar silkworm rearing performance reveal that shell weight of the cocoons during Spring season was significantly higher than Autumn crops and also silkworm weight. This clearly indicates that these characters were influence by the nutritional status of leaves rather than the environmental factors alone.

Rana *et al.*,(1987) studied food consumption, utilization and rate of growth of *Antheraea proylei* feeding with *Quercus serrata* leaf. The quality of food consumption increased with increase in age of the worm and reached its peak in the fifth instar. The assimilation and tissue growth were positively correlated to the amount of food consumed. The quality of leaves had got direct influence on the health, growth and survival of Oak tasar silkworm (Sinha *et al.,* 1986). Studies on foliar constituents of Oak tasar silkworm host plants were reported (Sinha and Jolly, 1971; Pandey 1993, Banerjee *et al.*, 1993; Ghose and Srivastava, 1996; Ghose *et al.*, 1995; Ponneuvel *et al.*, 1996). The difference in nutritional quality of host leaves was an important factor for the success and partly success. For instance, the predominant occurance of lepidopterous pests and feeding Chinese tasar silkworm, *Antheraea pernyi* on oak during the Spring season had been attributed to the presence of lesser amount of tannins,but increase of tannin in the following seasons the leaves become unsuitable for silk. In Spring season higher crude protein% and lesser crude fibre % resulting higher ERR% reported the influence of crude protein and amino acids on cocoon characters of Oak tasar silkworm *Antheraea proylei* **J.** .The quality of leaves had got direct influence on the healthy growth and survival of silkworm(Sinha *et al.*,) Better the quality of leaves, greater possibilities of obtaining good cocoon harvest. Therefore, the selection of the food plants possessing superior nutritive value could be utilized for the healthy development of silk for obtaining good cocoon crop. According to findings of Pandey and Goel(1991) crude protein contents of young leaves were higher than old leaves in three Oak species where *Quercus serrata* showed maximum *28.92%Q.semecarpifolia 20.77%,*and *Q.incana* 16.47%. but in old leaves contained nearly half of total protein contents of young leaves. The young leaves contained less crude fibres, old leaves had nearly double the fibre content.Pandey(1995) observed seasonal changes in the leaf composition of *Q.serrata,* where leaf proteins were 6.81% in March and 7.89% in April which were decreasing 4.74% in October,and ash 2.23% which was increased from March 1.95%, as result, the leaf quality of March and April month was found most suitable for rearing of *A.proylei* **J**..A strong positive correlation was found between leaf content and larval body weight. The higher survival of Oak tasar silk worm during Spring season may be due to higher protein content of the leaves during April. Leaf quality for many lepidopteron larve is determined on protein content basis(Mattson *et al.,* (1980).The Autumn crop of Oak tasar not fully success may be due to decline in protein content.Ponnuvel *et al.,*(1996) leaf moisture percentage of *Quercus serrata* leaves trends decreasing from February to November (71.9% to56.78)hey found that leaves containing higher amount of crude protein and amino acid resulted producing higher amount single cocoon and shell weight, cocoon yield per hundred larvae filament length and fibroin content of the cocoon shell. In this investigation leaf moisture and crude protein observed more in the Spring season than Autumn season and *Aspergillus niger* were also found more on the leaf surface in spring season than autumn season which may play an important role better (ERR%) cocoon weight, shell weight and more filament length.The reeling parameter of *A.proylei* **J.** cocoons under three treatments (Table:25) in present investigation result similar with other investigators.Devi *et al.,*(2012) reported Filament length 699.6 meters, Denier 6.6(D) ,NBFL 333.0,Recovery 74.4% and Reelibility 47.6%. .Tikko and Goel(1987) reported cocoon cooking with 1% sodium carbonate solution gives good results in respect of reelabity 60.28% and 61.83% with Biopril-50.

In this investigation shows that the fungal population of soil, leaf and air are highly influence by the environmental factors like light, temperature, humidity and rain fall. Low humidity and high precipitation adversely affect the air, leaf surface and soil mycoflora and low precipitation favours the population of saprophytic microorganisms. According to Gregory and Hirst (1957); Sharma *et al.,* (1984) and Thomspson *et al.,* (1993), the season is a dominating factor determining the qualitative and quantitative composition of the leaf surface mycoflora, and further variation in the total number of isolates indicates changes in density of the active population. These results are similar to the result obtained in the present investigation were done during 2013 and 2014 at Umrangso on *Quercus serrata* plantation.

It is also clear evident from the present result that phylloplane mycoflora isolates were also present in the soil and in air and vice-versa. Therefore it seems a logical probability that there was a continuous process of distribution of the mycoflora of soil, leaf surface and air and vice-versa. The situation can be explained as follows in a cyclic pattern.

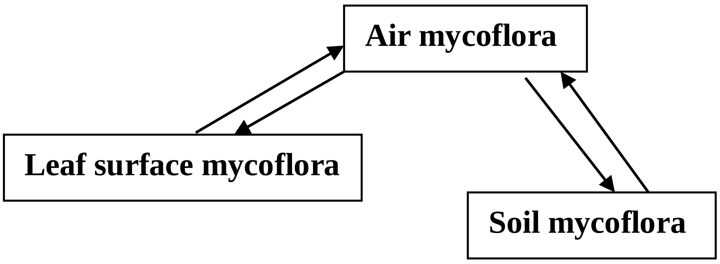

Fig 12: Cyclic pattern of mycoflora leaf to air and air to soil and vice versa.

The seasonal fluctuation in the population of leaf, soil and air mycoflora seems to depend upon the climatic factors *i.e.* temperature, humidity, wind velocity, phenology of the local vegetation and its associated fungi and precipitation. Further, the qualitative and quantitative variation of the total population of mycoflora in the soil may be due to inadequate soil moisture and nutrients, which affect the population (Rama Rao, 1970) and activities of the microorganisms, Waid (1960) suggested that fertility of soil and the fungal population of mycoflora, which seems to be a logical conclusion.

The present investigation is relating to the fungal population of rhizosphere and phylloplane of Oak tasar host plant (*Quercus serrata*) and their effect on the growth silkworm, development of cocoons and raw silk production may open new avenues of wider studies as no attempt had been made earlier to include both the rhizoplane and phylloplane fungal population relationship including that of air spora relating to Oak tasar host plant. The impact of fungal spores may probably due to the fact that the fungal populations of the soil provide essential nutrients for the plant growth and development. And these nutrients are translocated to the leaf and impacts upon the foliage quality by increasing or decreasing its moisture retention capacity, protein content, sugar and various other essential trace elements. The silkworm obtains its nutrition for the growth and development by feeding on leaves. It may be possible to exploit the situation once we understand in depth, the microbial correlation ship of the soil, phylloplane as well as of the air and the seasons and how best the beneficial and nutritive fungal spores for silkworm growth can be trapped and increased. Potential of *Aspergillus niger* and *Trichoderma viride* as bicontrol agents of wood decay fungi(Tiwari,2011).*Trichoderma* species are using for biocontrol` of plant pathogens in Vietnam(Tran, N.Ha 2010) will be to boost oak tasar culture in country India.

In the present investigation indicates that the fungi population particularly those present on the leaf surface have a direct bearing on the rearing of silkworm and therefore, further study relating to the association of not only fungi but also bacteria and other microorganisms with the leaves and also rhizosphere and their impact on the health of the silkworms and their development which help the raw silk production is essentially required. Although the present study involves only one host plant *i.e. Quercus serrata,* there are other varieties of hosts and the microbial association of these varieties may be different. Hence, the development of specific types of rhizosphere and phylloplane fungi depends up on many environmental factors as well as on the physiology of the plants and their interaction of the micro-organisms themselves in their spheres of occurrence. If scientifically exploited, such microbial relationships would be very beneficial to the silk industry. The present investigation is only an attempted to draw attention to the new but prospective areas of work relating to Oak tasar silkworm and silk production. The health of the plants, as well as nutritional status of the foliage produced by the plants and also the nutritional requirements of Oak tasar silkworms essentially needs exhaustive study. Further identification of season specific of food plants and silkworm breeds their improvement through breeding is necessary which may help to cope with the various seasonal problems associated with Oak tasar silkworm rearing.

The microbiology of all the host plants is still obscure, although their biology is known. Hence a thorough understanding of the microbiology of the different plants parts like leaves, flower, stem and roots of these plants needs to be studied in future. The present study suggests that there is certain role of fungal spores on the growth and development of Oak tasar silkworm, its cocoon and raw silk production, the microbiological aspects which is related to the rearing of Oak tasar silkworm must be looked from wider perspectives and it is also a very important that to evolving high yielding varieties host plants and using green manure and biofertilizer for soil health and rearing of high yielding varieties of Oak tasar silkworm and production more Oak tasar raw silk and earning more foreign exchange which will be boost up the rural economic upliftment and generating more employment which may help utilization of naturally grown oak flora and can be prevent the jhum cultivation in the hilly region which is less remunerative as compared to Oak tasar culture. Oak plants regulate water cycle; conserve soil moisture and environmental/ ecological stability of the fragile mountain ecosystem. It is a time to prepare an appropriate project to popularize and develop moment of Oak tasar culture in India by the government departments like sericulture, forest and non government organization. It will encouraging the conservation of Oak flora and generated more employment in the hilly region of sub Himalayans belt.