DISCUSSION
5. DISCUSSION

Sericulture is an activity, which is eminently suitable for people with limited skills and virtually no education. The main activities in sericulture are mulberry cultivation, silkworm rearing, silkworm seed production, silk reeling, twisting, dyeing and weaving. Silk reeling sector in India is cottage based and highly decentralised. There are different reeling devices in India viz., charka, filature consisting of cottage basin and domestic basin and multiend reeling basin. Charka reeling device is a crude contrivance for producing silk, which has minimum mechanisation and practically no gadgets. These charkas could be hand operated or motor operated. Of late, more and more charkas are being made motor operated due to increasing labour cost. The charka silk has distinct identity in the market and it is generally associated with poor quality. However, a small proportion of good quality charka silk is also a reality. Charka silk is largely preferred by the handloom weavers (Shekar Prabha 1992).

The filatures have comparatively better mechanisms and basic gadgets capable of producing better quality raw silk. The filature silk with wide ranging quality is produced in reality (Gopal and Asopa, 1993). They fetch higher prices than the average price of charka silk and are purchased by handloom weavers and powerloom weavers and the best quality by the zari manufacturers. The capacity to purchase cocoons in the case of filature reelers is better than that of charka reelers. The upper end
of the reeling technology has multiend reeling machine. In India, the automatic and semi-automatic reeling machines have been a failure in meeting the economic, productivity and quality requirements of the industry owing to its huge investment cost and serious limitations of the basic raw material viz. cocoons. Multiend reeling machine is an improvement over the cottage basin and is the most appropriate technology that can handle the available quality of cocoons to produce gradable quality raw silk. However, the investment cost is very much on the higher side in comparison to cottage basin or domestic basin of equivalent capacity.

Reeling is carried out mainly in small units with wage labour or family labour. Wage labourers in reeling are among the poorest and substantial numbers are from disadvantaged groups. Reeling is an activity in which men, women and children are employed. However silk reeling is considered the most problematic of sericulture activities as significant number of people engaged in activities related to silk reeling become victims of health problems. With silk reeling being an important source of income and employment for a significant number of people in Ramanagara, the workers organize their lives around activities related to silk reeling.

The present study carried out in Ramanagara, a well-known place for silk reeling in Karnataka, comprised 500 workers for the general survey accounting for 49.8 percent males and 50.2 percent females. With respect to educational level of workers working in reeling units 42.8 percent of workers were found to be
illiterates and 48.6 percent of them had primary education. This reveals that the workforce in the reeling sector are either illiterates or with minimum education level.

In the present study 8.8 percent of the respondents were found to be addicted to smoking and they were showing signs of asthma, all of them being males and none were females. Respiratory problems faced by men are known to be aggravated by smoking (Chhabra et al., 2001). Cigarette smoking has been reported to be associated with the development of occupational asthma in workers exposed to platinum salts and anhydride compounds, which are chemicals that cause asthma through an IgE mechanism (Venables et al., 1985, 1989). Smoking also seems to affect the underlying mechanisms involved in occupational asthma, as the cellular composition of airway mucosa appears different in smokers with asthma and nonsmokers with potroom asthma (Sjaheim, et al., 2004). In addition, smoking increases the risk of sensitization to high-molecular-weight agents that cause occupational asthma through an IgE mechanism.

Poverty was found to adversely affect the workers as the reeling workers not only suffered from acute poverty but also had to be content with occupational health problems among which some had allergic reactions from silk allergens, which resulted in respiratory problems leading to asthma. Most of these people were unable to leave work though it was progressively impairing their health status. Most of these workers cannot afford to have modern treatment modalities such as inhaled bronchodilators and inhaled
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steroids, consequently the severity of airflow obstruction is expected to worsen over time, rendering many subjects disabled.

In the present study 12.6 percent of the respondents found themselves relief by resorting to alcohol consumption, which constituted 4.4 percent males and 8.2 percent females of the total respondents. Other personal habits like tobacco chewing and use of snuff were also observed. Consumption of snuff accounted for 6.2 percent and tobacco chewing 31.2 percent and this practice was prevalent only among females. Habits such as smoking and use of snuff may affect respiration leading to respiratory problems, ultimately resulting in asthma in chronic cases.

Charaka units are cheaper to set up with a limited capital and most of the charakas in Ramanagara were found functioning with family labour. Of the respondents considered for the study, 11.6 percent represented charaka units and majority of them were family members. Cottage basin units and multiend units together were represented by 88.4 percent of the total workers surveyed. The health problems that many of the reeling workers face are mainly attributed to the technology of reeling. The labourers involved in charaka reeling appear to have marginally more health problems than the workers in cottage basin units and multiend units. Charaka reeling machines are built with the basin where the cocoons are cooked is directly in front of the reeler, who breathes in the sericin-laden steam on a continuing basis for several hours everyday. The level of exposure of the workers to the sericin laden steam is more as the water in the reeling basin is usually at higher temperature, leading to dampness in the unit,
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adversely affecting the visibility of the workers. Moreover the silk waste is also dried inside the unit (fig. 2), thus adding to the unhygienic environment. Cottage basin units and multiend reeling units do not have the cooking units in front of the reeler but at one of the corners. However the reelers in cottage basin and multiend units are also exposed to the steam coming out of the cooked cocoons as the cocoons are placed into the reeling basin in front of the reeler directly from the cooking basin without conditioning.

Since cocoons are cooked using ovens of simple design with loose biomass as fuel it leads to smoke and dust in charaka and cottage basin units. Inefficient use of biomass fuel leads to substantial heat loss by hot flue gases adding to the increased temperature in the working area and poor working conditions. Smoke is also harmful when inhaled for hours everyday. The cumulative effect of smoke in their homes and the smoke in the working place appears to have caused more harm to the women than to the men. Smoke is also known to increase the risk of cataract (Shalini et al., 1994; Saha et al., 2005). Symptoms of carbon monoxide toxicity consisting of headache, dizziness and sometimes nausea and vomiting, usually not severe, have been reported in Japan, where sericulture was a common home industry, as a result of the use of charcoal fires in poorly ventilated rearing rooms (Kubota, 1983). An efficient biomass gasifier system could improve the working conditions besides improving the energy efficiency and productivity of reeling sector (Sunil Dhingra et al., 2003)
Most of the reeling units in Ramanagara are located in small houses wherein the floors of most of the silk reeling units are wet due to constant water usage without proper drainage (fig.9) and ventilation. In such circumstances where the workers do not usually wear footwear the feet gets infected due to continuous contact with damp floors with improper and unhygienic drainage system in reeling units. Separation of pelade layer from the pupae is done inside the reeling unit itself in majority of the units (fig. 10). Separating the pelade layer from the pupa by squeezing the individual cocoons by hand is itself a degrading task besides creating foul smell and unhealthy environment in the unit.

Of the workers surveyed 59.6 percent were involved in reeling and re reeling work and 26.5 percent were involved in cooking cocoons and cleaning. Those who were engaged in supervisory work were lesser in number and constituted a total of 7.6 percent of which males and females were equally divided. In sorting work there were the least number of workers accounting for a total of 6 percent.

As a consequence of the constant immersion in scalding water, the skin on the hands of the reelers including children becomes raw, blistered, and sometimes infected (fig. 6). The workers engaged in silk reeling units are reported to be more susceptible to fungal and skin infections like dermatophytosis due to constant immersion of hands in hot and turbid water (Dandin, 1999). The skin lesions, localized mainly on fingers, wrists and forearms, were characterized by erythema covered with small vesicles, which become chronic, pustular or eczematous and
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extremely painful. This is probably related to the temperature of the reeling bath and the decomposition products of the dead chrysalis (Kubota, 1983).

In addition to the skin ailments, reelers frequently suffer from respiratory problems, caused by the constant inhalation of the sericin vapours. Sensitization to mulberry silk can be attributable to allergens in the silk cocoon, silkworm pupae, and unprocessed silk threads. Silk workers involved in sorting or cooking the cocoons and in reeling, or degumming the threads can be sensitized to silk by inhalation of airborne allergens (Uragoda and Wijekoon, 1991). Asthma characterized by cough, tightness of the chest and wheezing was reported among workers in silk filatures involved in different occupations like sorting, steaming, cooking, reeling and skeining. Occupational asthma was found to be more pronounced in subjects from sorting, cooking and reeling sections (Harindranath et al., 1985).

It is likely that in the present case the workers in the cooking section could have been exposed to an environment contaminated with the substances from cocoons and pupae carried with steam and splashed water during the process of cooking and brushing the cocoons. This could perhaps account for the higher degree of sensitization among this group of workers. The larger proportion of workers in these sections are women and hence greater impact is on women.

Exertion and exposure to cold, dry air, dust, fumes, and sprays are common in the workplace and may aggravate asthma
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(Tarlo et al., 2000; Saarinen et al., 2003), especially in those with moderate to severe disease and in those not receiving optimal treatment.

Children are employed (figs. 7 & 8) to do unskilled work, cooking of cocoons and picking up pupae, jobs that are paid less than the reeling labourers. 17 percent of the total respondents considered for the study were below the age of 14 years indicating large number of children being employed in these units. These children work in an environment generally contaminated with airborne fragments from unprocessed cocoons carrying the allergenic components. As in other industries, the myth of children having natural advantages and skills is used to justify the exploitation of young girls and boys in this dangerous work. This myth is perpetuated not just by the employers of the children, but also by society as a whole, including the educated elite.

Extensive long-term epidemiological observations carried out in the former USSR also have shown that workers in the natural silk industry may develop respiratory allergy featuring bronchial asthma, asthmatiform bronchitis and/or allergic rhinitis. It has been reported that natural silk can cause sensitization during all stages of production (Kubota, 1983).

While the problems associated with silk allergens has been confirmed in terms of their causal relationship, and may be classified under occupational asthma, a considerable gray area persists with the remaining and still high proportion who do not
show allergic reactions to the silk allergens but do have respiratory problems. This may be attributed to the atmospheric pollution, unhygienic conditions and the burning of biomass fuel for cooking the cocoons.

When work-aggravated asthma occurs on a regular basis rather than from a single incident, it can be assessed by measuring peak expiratory flow rates (PEFRs) and by symptom/medication diaries (Cristina et al., 2005). More than 80 percent of the respondents in the present study showed a peak expiratory flow rate between 250 to 400 L/min indicating the need for attention towards health condition, while 11.32 percent of the respondents showed a peak expiratory flow rate below 250 L/min demanding immediate medical attention.

Total serum Immunoglobulin E (IgE) levels exceeded the normal range of 150 IU/ml in more than 55 percent of the respondents denoting an increased probability of an IgE-mediated hypersensitivity, responsible for allergic reactions. Patients with atopic allergic diseases such as atopic asthma, atopic dermatitis, and hay fever have been shown to exhibit increased total immunoglobulin E levels in blood. Elevated levels of IgE also indicate parasitic infestations such as hookworm, and certain clinical disorders including aspergillosis, have also been demonstrated to cause high levels of IgE. Demonstration of elevated levels of specific IgE antibodies in a subject however does not always correlate with clinical illness. These factors have to be correlated and viewed in the clinical context (Omprakash, 1999).
Certain groups of white blood cells, including basophils and tissue mast cells, have membrane receptors for the IgE molecule. These target cells, through a series of complex reactions, form a combination of a specific allergen with antibody-sensitized basophils such as histamine, into the blood stream. As a result of these biochemical mediators, there is a constriction of smooth muscles, dilation of small blood vessels, activation of blood platelets, and irritation of skin nerve endings characteristic of allergic reactions. Typical clinical symptoms of immediate hypersensitivity are inflammation and itching in a skin reaction, or congestion in a bronchial reaction. The most common type of occupational asthma, accounting for majority of the cases, is immunologic occupational asthma, induced by an IgE mechanism or other immune responses, such as cell-mediated immunity to specific workplace agents. The less common type of occupational asthma, irritant-induced asthma, accounts for fewer number of cases (Tarlo and Liss, 2003).

The IgE serum concentration in a patient is dependent on both the extent of the allergic reaction and the number of different allergens to which he is sensitized. Nonallergic normal individuals have IgE concentrations that vary widely and increase steadily during childhood, reaching their highest levels at age 15 to 20, and thereafter remaining constant until about age 60, when they slowly decline.

The airway inflammation process is similar in IgE-dependent and IgE-independent asthma (Turato and Saetta, 2002; Saetta et al., 1992; Bentley et al., 1992) and is
characterized by the presence of eosinophils, lymphocytes, mast cells, and thickening of the reticular basement membrane. In the bronchial airways, inflammatory cells not only increase in number but also get activated (Frew et al., 1995), resulting in the secretion of a wide range of proinflammatory mediators and proteins, which have a variety of harmful effects, such as toxic damage to epithelial cells.

Eosinophil count in the present case exceeded the reference range in 67 percent of the respondents, supporting the diagnosis of asthma. Eosinophils increase in many states of allergy, and presumably the cause of eosinophilia in these subjects was asthma (Inbanathan et al., 1998). In the airway inflammatory process of occupational asthma, eosinophilia is associated with an increased number of T cells, especially CD4+ cells, which exhibit signs of activation (Frew, 1995). Peripheral blood eosinophilia is associated with asthma and increased airway responsiveness in Western countries with low prevalence of parasitic diseases (Tollerud et al., 1991; Jansen et al., 1999). Eosinophilic bronchitis has been described as a cause of chronic cough characterized by sputum eosinophilia in the absence of demonstrable variable airflow limitation or nonspecific airway hyper responsiveness (Gibson et al., 2002).

Reducing workplace exposure to respiratory irritants; limiting exposure to relevant environmental allergens and non-occupational irritants such as tobacco smoke and optimizing antiasthma therapy, educating the patient about how to use the drugs, and emphasizing the importance of compliance often allow