International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 11 ǁ November 2022 ǁ PP. 263-267

The Knowledge and Adoption Level of Improved Sericultural Technologies by the Farmers: A Case Study

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ABSTRACT
The advent of contemporary sericulture technology sparked the transformation of Indian sericulture, resulting in a large rise in sericulture output capacity. The present study was conducted to investigate the knowledge and adoption of new technologies in sericulture in the Arsikere taluk of Hassan district (Karnataka). The data was acquired using a pre-designed questionnaire to measure the level of knowledge about sericulture technologies and the execution of those technologies in practice. In this study, we found that 75% of farmers were literate, whereas 25% were illiterate. The knowledge level of mulberry cultivation, including mulberry varieties, the use of composts and organic manures, fertilizers application, drip irrigation, mechanization in mulberry cultivation, and pest and disease control, was greater than 70%, but the adoption level was lower compared to the knowledge level. Similarly, more than 80% of the respondents are familiar with silkworm rearing technologies, including the use of productive breeds, disinfection and hygienic practices, bed cleaning, disease and pest management, the use of heaters and humidifiers, and IPM of the Uzi fly, but their adoption level is not in line with their knowledge. Our survey reveals a significant gap between knowledge and acceptance, which suggests that it will close quickly if farmers are given the right direction and sufficient financial support for effective technology adoption.

KEYWORDS: Arsikere, Cocoons, Karnataka, Mulberry, Sericulture extension, Silkworm.

Date of Submission: 12-11-2022 Date of acceptance: 25-11-2022

I. INTRODUCTION

Sericulture is one of the welfare-oriented businesses that have the potential for rapid and long-term economic growth (Bhattachariya *et al.,* 2019). This business is noted for its natural products, notably cocoons and eventually silk (Kumar *et al.,* 2019). This silk entices the globe with its magnificent textile capabilities, earning it the title of "Queen of Textiles" in this process (Parimala *et al.,* 2009). On the other hand, the trustworthiness of silk quality and productivity is controlled by the quality of the cocoon, which is determined by the sericulture knowledge of the farmers (Gupta *et al.,* 2021). As a result, understanding each fundamental feature of sericulture as well as contemporary technologies in cocoon production is essential for becoming a successful entrepreneur. At the same time, several new technologies have been developed by the scientists of research institutes that are boons for the development of the sericulture industry. But unless all these innovations reached the farmers, their socioeconomic development would not take place (Ruttan et al., 1979). Since then, India has become the world's second-largest silk producer, of which 87.3 lakh people are directly or indirectly involved in sericulture activities to maintain their socio-economic conditions and for sustainable development. Of which Karnataka accounts for 30% of the country's raw silk output, 1,38,864 people are directly or indirectly involved in the soil-to-silk activity (Anonymous, 2022). Despite all these positive perspectives on sericulture in Karnataka, mulberry sericulture is not precisely practiced by the farmers up to the desired level. There is a wide gap in the productivity of the cocoon between research institutes and farmers' fields and also from one farm to another due to partial or no adaptation of improved sericulture technologies (Kumaresan et al., 2005; Lakshmanan, 2007; Ravindran et al., 1993; Raveendra et al., 1997; Raveendra et al., 2009). As a result, farmers are getting low net returns, and they are looking for other crops or avenues for a better livelihood. Therefore, proper extension activities are mandatory to increase farmer awareness about new technologies for improving sericulture. Since knowledge of the advanced sericulture techniques and their adoption are influenced by various factors like education and the economic conditions of the farmers, the study was undertaken to know the impact of education on knowledge and adoption of sericulture technologies in Arsikere taluk of Hassan district.

STUDY AREA AND METHODOLOGY

The present study was conducted in the Arsikere taluk of Hassan district (Karnataka), which has a total of 1,325 ha of mulberry plantations and produces 89 MT of bivoltine raw silk annually (Seri States of India, 2019). It is located at $13^0$18'52"N, $76^0$15'25"E with an average elevation of 812 meters and temperature ranges between 14-19^0C to 26-35^0C. In general, the taluk is characterized by red soil derived from granite genesis rock and a large number of sericulture farmers. Among them, sixty farmers were randomly chosen, and the data was collected using the individual contact method using a predefined questionnaire. The knowledge and adoption level of new sericulture technologies in mulberry cultivation practices like the usage of high-yielding varieties, regular practice of soil testing and reclamation, application of the recommended dose of soil amendments (compost and manures, bio-fertilizers, bio-pesticides, green manures, and fertilizers), practice of drip irrigation, mechanization in plantation management (harvesting, pruning, ploughing, and weeding), application of plant protection measures, and usage of foliar nutrition supplements were examined and analyzed. Similarly, for advanced sericulture technologies in silkworm rearing, practises like proper application of surface and bed disinfectants, applications of hormones, usage of high yielding breeds/hybrids/double hybrids, adoption of advanced rearing equipment like (room heaters, humidifiers, ribbon/plastic mountages, dry and wet bulb thermometers, and cocoon deflossers, bed cleaning, the adoption of proper leaf preservation structures (Anteroom), and the practice of proper IPM measures on the uzi fly were examined and analyzed. The data collected on educational levels was classified as a percentage of graduates, higher secondary level, primary level, and illiterates. Based on their knowledge of sericulture technologies, farmers were classified as having full knowledge (FK), partial knowledge (PK), or no knowledge (NK), and their percentages were calculated. Similarly, based on the adoption of sericulture technologies, farmers were classified as full adapters (FA), partial adapters (PA), and non-adopters (NA) Data on educational levels, knowledge of advanced sericulture technologies, and their adoption were analyzed in the same way as Hadimani et al. (2019).

II. RESULTS AND DISCUSSION

Education Level of Sericulture Farmers

Education levels play a key role in bringing about desirable changes in human behavior. Therefore, knowing the education level helps determine the current knowledge associated with activities. In the present study, the qualifications of the respondents have been classified as illiterate, primary school educated, higher secondary school educated, and graduate, and the data reveals that the literate percentage (75%) is three times more than the illiterate percentage (25%). Figure-1 shows that the percentage of graduates was 7%, the higher secondary school level was 22%, the primary level was 46%, and the illiterate percentage was 25.00%, which is similar to the findings of Shireesha et al. (2020).

FIGURE 1

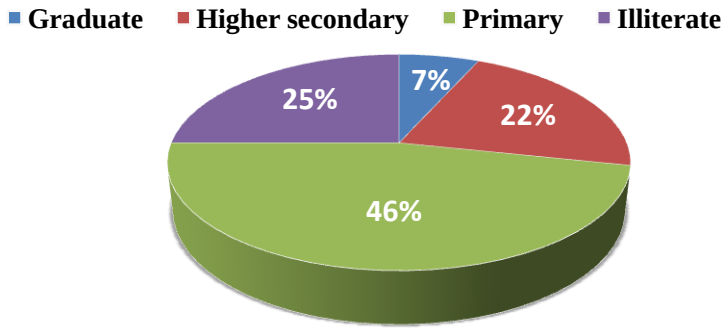

Figure 1: Education level of Sericulture Farmers of Arsikere taluk of Hassan District

Since silkworms are monophagous to mulberry leaves, the success of cocoon harvest is directly proportional to the quality and quantity of leaves the silkworms feed. Table 1 shows the respondents' knowledge and adoption status of advanced sericulture technologies in mulberry cultivation. The data revealed that 100% of the respondents had full knowledge of the new mulberry varieties and had adopted high-yielding varieties for mulberry plantation establishment. The farmers adopted the V-1 variety for mulberry plantation establishment, which is recommended for irrigated conditions in the tropical region (Dandin and Giridhar 2014). Soil testing and reclamation knowledge were 43.33% (FA), 25.00% (PA), and 31.67% (NA), and the adoption level was 20% (FA), 30% (PA), and 50% (NA). The knowledge and adoption level for the application of the recommended dose of soil amendments were as follows, Cent percent of farmers have complete knowledge of and have adopted the use of compost and manures. The green manure application knowledge percentage of

respondents was 25.00% (FK), 16.67% (PK), and 58.33% (NK), and the adoption levels were 11.67(FA), 16.67% (PA) and 71.67% (NA). The knowledge and adoption percentage of respondents on the application of bio-fertilizers like Seri-azo, Seri-phos, Vesicular Arbuscular Michoriza (VAM), are as follows: 21.67% have (FK), 11.67% (PK), and 66.67% (NK) and their adoption levels are 3.33% (FA), 5.00% (PA), and 91.67% (NA). These biofertilizers like Seri-azo can satisfy 50% of the nitrogen chemical fertilizer requirement, Seri-phos increase the phosphorus availability to mulberry plants, and VAM reduces 15-20% of the recommended dose of phosphatic fertilizers (Dandin and Giridhar 2014). Though these applications are cost-effective, more than 70% of the respondents have no knowledge, which remains enigmatic. And also the farmers are unaware of or do not use bio-pesticides like Navinya-against root rot disease (Anonymous 2019), Nema-guard, and Nimhari-against root-knot disease (Anonymous 2019) for mulberry garden maintenance. Similarly application recommended fertilizer knowledge level was, 75.00% (FK), 16.67% (PK) and 8.33% (NK), and the adoption levels were 20% (FA), 71.67% (PA), and 8.33% (NA). Irrigation helps in the better utilization of manure and fertilizer for the growth and development of mulberry. Among the several methods, drip irrigation can save 30-40% of water when compared to the furrow method of irrigation (Dandin and Giridhar 2014). Therefore, the knowledge level on drip irrigation of the studied respondents was 71.67% (FK), 21.67%(PK), and 6.67%(NK), and their adoption level was 41.67% (FA), 25% (PA), and 33.33% (NA). The knowledge and adoption levels of respondents on mechanization in harvesting and pruning were only 8.33% (PK) and the remaining 91.67 % (NK) and none of the farmers have adopted mechanization. At the same time, 95% of the respondents have full knowledge and 5% have partial knowledge of mechanization in ploughing and weeding, and the adoption level was 85% (FA) and 15% (PA) Concerning the practice of plant protection measures, the knowledge level was, 75% (FK) and 25.0% (PK), whereas their adoption was 71.67% (FA), 16.67%, and 11.67% (PA). At last on foliar nutrition supplements like Poshan (Anonymous 2019, Dandin and Giridhar 2014) knowledge level of respondents was 38.33% (FK), 25.00% (PK), and 36.67% (NK), and the adoption percentage was 13.33% (FA), 21.67% (PA), and 65.00% (NA).

The knowledge level of mulberry cultivation, viz., mulberry varieties, usage of compost and manure, application of fertilizer, drip irrigation, mechanization in plantation management, and pest and disease management, is approximately more than 70%, whereas the adoption level varies with each practice and is not up to the knowledge level. Furthermore, the knowledge and adoption of mulberry cultivation technologies presented (**Table 1**) are very similar to Mallikarjuna et al. (2008) research findings.

Table 1

Table 1: Knowledge and adoption level of farmers on mulberry cultivation

Sl No.	Mulberry cultivation practices	Knowledge Level (%)			Adoption Level (%)		
		FK	PK	NK	FA	PA	NA
1	High yielding mulberry varieties	100.00	0.00	0.00	100.00	0.00	0.00
2	Soil testing and reclamation	43.33	25.00	31.67	20.00	30.00	50.00
3	Compost and manures (FYM) application	100.00	0.00	0.00	100.00	0.00	0.00
4	Green manuring	25.00	16.67	58.33	11.67	16.67	71.67
5	Bio-fertilizers	21.67	11.67	66.67	3.33	5.00	91.67
6	Bio-pesticides	0.00	0.00	100.00	0.00	0.00	100.00
7	Recommended fertilizers application	75.00	16.67	8.33	20.00	71.67	8.33
8	Mechanization in harvesting and pruning	0.00	8.33	91.67	0.00	0.00	0.00
9	Mechanization in Ploughing and weeding	95.00	5.00	0.00	85.00	15.00	0.00
10	Drip irrigation	71.67	21.67	6.67	41.67	25.00	33.33
12	Plant protection measure for both pest and diseases	75.00	25.00	0.00	71.67	16.67	11.67
13	Foliar nutrition supplements	38.33	25.00	36.67	13.33	21.67	65.00

Full knowledge (FK), Partial Knowledge(PK), No Knowledge(NK), Full adaption(FA), Partial adaption(PA) and Non-adaption(NA).

Knowledge and adoption level of new technologies in silkworm rearing practices

Data on the knowledge status of the respondents on new silkworm rearing practices are given in Table 2. According to the data presented above, all the respondents have full knowledge of the disinfection of rearing equipment and appliances, but the adoption level was only 85% (FA), and 13.33% (PA). These regular practices can reduce the pathogen density load in the rearing environment and reduce the disease incidence in silkworm rearing practices (Dandin and Giridhar, 2014). Similarly, for the usage of bed disinfection, 91.67% of

respondents have full knowledge; the remaining 8.33% of farmers have partial knowledge, but their adaption levels were 58.33% (FA), 25.00% (PA), and 16.67% (NA). The knowledge level on the application of hormones like Sampoorna and Samrudhi to silkworm (Anonymous 2019) was, only 5% (PK) and 95% (NK), but none of the respondents adopted them. Regarding knowledge and adoption level on the usage of advanced rearing equipment like plastic collapsible and ribbon mountages for silkworms, the percentages are as 38.33%(FK), 18.00%(PK), and 26.67% (NK) whereas the adoption level is limited to 6.67% (FA), 5.00% (PA), and 88.33% (NA). Due to the adverse climatic conditions, understanding the usage of a humidifier and a heater in the house becomes critical. The adoption temperature and humidity indicators such as wet and dry bulb thermometer, humidifiers, and heaters in the rearing house knowledge levels were 90% (FK) and 10% (PK), but the adoption levels were 20% (FA), 5% (PA), and 75% (NA). However, many farmers follow indigenous methods to maintain temperatures, which have their limitations in maintaining them regularly. One hundred percent of respondents said they had no idea about using a cocoon deflosser. According to the regular bed cleaning practices in silkworm rearing, 85% of farmers have full knowledge, 15% have partial knowledge, and adaption levels are 80% (FA), 10% (PA), and 10% (NA) non-adaption. These regular bed cleaning practices enhance the cocoon harvest by reducing secondary infection from disease in the rearing bed. The majority of respondents have complete knowledge on using productive breeds/hybrids/double hybrids of silkworms for silkworm rearing activities. In the heavy rainy season, the harvesting of leaves in advance becomes routine practice that necessitates separate proper leaf preservation structures. In the studied respondents, the knowledge level on having proper leaf preservation structures was 85% (FK) and 15%(PK) but their adaptation rates were 58.33% (FA) and 41.67% (NA). Uzi is one of the principal pests of silkworms, which can reduce 10-30% of the cocoon crop yield, therefore, adoption of a proper integrated pest management approach is necessary. The studied respondents have 81.67% full knowledge, and the remaining 18.33% have partial knowledge. They followed IPM measures in uzi management, but the adaptation of the practice was 35.00% (FA), 58.33%(PA), and 6.67%(NA).

The study reveals that all the above-mentioned practices knowledge level of approximately more than 80% except for the usage of hormones, cocoon deflossers, and mountages, but the adoption level was lower compared to their respective knowledge levels. Therefore, it is suggested/mandatory for extension personnel to create more awareness about the improved silkworm rearing technologies among the sericulture farmers to produce the cocoon at a desired level. Finally, the knowledge and adoption of silkworm rearing practices presented (Table 2) are strikingly similar to the findings of Priyadarshini and Kumara (2013).

Table 2

Table 2: Knowledge and adoption level of farmers on silkworm rearing practices

Sl No.	Silkworm rearing practices	Knowledge Index (%)			Adoption Index (%)		
		FK	PK	NK	FA	PA	NA
1	Disinfection of rearing appliances and rearing house	100.00	0.00	0.00	85.00	13.33	0.00
2	Use of bed disinfectants	91.67	8.33	0.00	58.33	25.00	16.67
3	Usage of Sampoorna and Samrudhi hormones	0.00	5.00	95.00	0.00	0.00	100.00
4	Ribbon and plastic mountages	38.33	18.33	26.67	6.67	5.00	88.33
5	Wet and dry bulb thermometer, Humidifier and Heaters	90.00	10.00	0.00	20.00	5.00	75.00
6	Cocoon Deflosser	0.00	0.00	100.00	0.00	0.00	100.00
7	Bed cleaning	85.00	15.00	0.00	80.00	10.00	10.00
8	Highly productive breeds	100.00	0.00	0.00	100.00	0.00	0.00
9	Separate room leaf storage	85.00	15.00	0.00	58.33	41.67	0.00
10	IPM for Uzi fly management	81.67	18.33	0.00	35.00	58.33	6.67

Full knowledge(FK),Partial Knowledge(PK), No Knowledge(NK), Full adaption(FA), Partial adaption(PA) and Non-adaption(NA).

III. CONCLUSIONS

The study revealed that farmers who were educated had good knowledge and had adopted the improved sericultural technologies. The farmers who have partial knowledge of new technologies in sericulture have adapted few technologies and are getting lower yields compared to those who have full knowledge and adaptation practices. As a result, people's education levels and proper extension activities for transferring new technologies from lab to land play a significant role in the adoption of new practices (Sujatha et al., 2015).

Although farmer knowledge levels are related to education levels, the adoption of technologies requires significant financial assistance from the government and extension services to improve sericulture farmers' socioeconomic status.

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