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Silkworm Production and Constraints in Eastern Tigray, Northern Ethiopia

Alembrhan Assefa Weldeyohannes

Department of Biology, College of Natural and Computational Science, Adigrat University,
P.O. Box 50, Adigrat, Ethiopia

ABSTRACT: Sericulture is an agro based industry, playing an important role in community of the world. An assessment was conducted to assess the silkworm production and identify the major constraints for silkworm raring in eastern Tigray from February to May, 2014. Primary data on type of silk worm, food (host) plants of silkworm used, annual income and major constrains were collected from silk worm rears using semi structure interview. Two types of silk worms were identified namely, mulberry and eri silk worms. Mulberry silk worm was more adapted to the study area. The main food or host plants were mulberry for mulberry silkworm and castor for eri silk worm, respectively. The average annual silk production ranges from 100 to 500 kg of silk. Mulberry silkworm produces higher kilograms of silk and income per year than eri silkworm. The major constraints were lack of food or host plants, drought, lack of knowledge such as training, lack modern house, lack of market availability, lack of governmental and nongovernmental support, lack wide area, lack of silk worm production materials and seasonal environmental condition fluctuation. Despite all the constraints, the area has great potential for silk production. Therefore, the people should be aware on silk worm farming and the government also fulfills the facilities for high potential of silk production at regional and federal level.

KEYWORDS: Constraints, host plant, silk, silkworm, Tigray, Ethiopia.

1 INTRODUCTION

Silk is a functional term used to describe protein fibers that are secreted by arthropods. It is a natural protein fiber and is very soft, lustrous, smooth, strong and durable than any natural or artificial fibre [1]. Silkworm can be taxonomically classified as Phylum: Arthropoda, Class: Insecta, Order: Lepidoptera, and Family: Bombycidae, Saturnidae, Lasiocampidae, Thaumetopoidae, etc [2]. According to Jolly *et al* [3] there are about 80 species of silkworms. Silks worms can be broadly classified as mulberry silkworms and wild or non mulberry silkworms. Mulberry sericulture deals with production of mulberry silk from domesticated silkworm *Bombyx mori* which significantly dominate the international silk trade. However, non-mulberry sericulture is universally known as forest or wild sericulture and deals about silk produced from wild silk producing moths from different lepidopteran families. Eri, tasar and muga are some of the non-mulberry silks produced from non mulberry or wild silkworms [2].

Many countries have been involved in sericulture industry development and more than half of these countries are situated in Asia and more than 85% of raw silk is produced by the five major silk producing countries such as China, India, Uzbekistan, Brazil and Thailand [4]. Silk has been used for textiles for thousands of years in Africa too [5, 6]. The potential of the African indigenous silk moth species for wild silk production has been well documented in Nigeria [7], Uganda [8] and Kenya [9] and other central and southern African countries.

Silk played an important role in the social and religious life of Ethiopia from the earliest days of the Kingdom of Axum [10]. The silk was imported in large quantities from India, Arabia and China and stored in vast caverns in the central highlands of Ethiopia [10]. Ethiopia is granted with diversified climate, vegetation and topography [11, 12] and this is also true for diversified options of sericulture industry which are adopted on different vegetation (for rearing of silk-worms) and different species of silkworms. However, there were no known records of silk being produced in the country until 1930's. In 1930s,

Corresponding Author: Alembrhan Assefa Weldeyohannes

however, the Italians realized the suitability of climatic condition for rearing of silk worm and availability of necessary resource [12].

Later on, visits paid by expatriate professionals also confirmed the immense potential of the country for silk production and sericulture project was reinitiated jointly by Ethiopian Institute of Agricultural Research and Ministry of Science and Technology in early 2000's and an exciting opportunity for producing silk came in to re-emergence with the introduction of eri and mulberry silkworms from different countries [10]. However, most researchers revealed that eri silkworm is very suitable for Ethiopian conditions due to different reasons such as its hardness, disease resistant, having short production cycle (46 days) and etc. As a result a silk production from eri silkworm is commonly practiced in Ethiopia [10, 13]. However, currently the people of country develop awareness to rare both the domestic and wild types of silkworms extensively for high silk production. Particularly in Tigray region there are private and small and micro enterprises participated in raring silkworm as a main agricultural sector. But, the expected income from this sector is not obtained due to different constraints. Therefore, this study was conducted to assess the silkworm production and major constraints in Eastern Tigray, Northern Ethiopia.

2 MATERIALS AND METHODS

2.1 STUDY AREA

The study was conducted from February to May, 2014 in Eastern zone of Tigray region which is located in Northern part of Ethiopia 850 Km far from Addis Ababa, the capital city of Ethiopia and 40 Km far from Mekelle, the capital city of Tigray regional state. The rain fall of this area is bimodal with short rain season occurring between February and April and long rain season from June to August. It's the maximum and minimum annual rain fall is 1200 mm to 500 mm, respectively. The annual temperature is 35 to 25 degree celsius. Agriculture is the main occupation of the people of the area and silkworm production is not widely used but recently the people are introduced silkworm production as a source of income. In eastern Tigray such as in Adigrat, Wukro, and Hawzen towns silk production is extensively practiced.

2.2 DATA COLLECTION AND ANALYSIS

Primary data were collected through the semi structure interview with the silkworm rears (silkworm keepers) of Adigrat, Wukro, and Hawzen silk production areas. Data on type of silkworm owned, type of food or host plants of silk worm used, annual income, and major constraints of the silk worm production were conducted. The collected data was analyzed using manually then the result was presented by using tables.

3 RESULT AND DISCUSSION

3.1 TYPE OF SILK WORM AND FOOD PLANTS

Silkworm rearing is the recent widely spread practice in the farming communities of the study area. The study was identified two types of silk worms namely, mulberry and eri silkworms (Table 1). Mulberry silkworm was more adapted to the environmental condition of the area. But according the previous information mostly eri silkworm was more practiced in different part of Ethiopia [10, 14]. However, recently mulberry silkworm is become more practiced and adapted to the situation of the country and it delivers a great silk than the eri silkworm. This might be due to characteristics of the mulberry silk worm, which is mostly domesticated where as eri silk worm is forest or wild silkworm [2, 15]. In addition to this people of the country also increased his awareness to rear the silkworms domestically, which is favorable to mulberry silk worm.

Mulberry and caster plants were identified as the major food plants of the silkworms in the area (Table 1). Mulberry was the host plant for mulberry silk worm while caster leaves for eri silk worm. The availability of food or host plant has a great role for increasing the production potential of silk worm [13].

Table 1. Type of silkworm and food plants in Eastern Tigray, Northern Ethiopia, 2014.

Type of Silkworm	Status	Food plant
Mulberry Silkworm	Well adapted	Mulberry
Eri Silkworm	Partially adapted	Caster

3.2 SILK PRODUCTION POTENTIAL

The average annual silk production potential ranges from 100 to 500 kg of silk (Table 2). The price of 1 kg silk was on average 165 and 100 Ethiopian birr (ETB) (8.5 and 5.1 USD) from mulberry and eri silkworms, respectively. Mulberry silk worm was produces higher kilograms of silk and income per year than eri silk worm. This might to be due to the well adaptability of mulberry to the environmental condition of the area. It is estimated that a silkworm rears could get about 61, 000 ETB (3,128 USD) gross benefit annually from mulberry silk worm while 20,000 ETB (1, 025 USD) from eri silkworm. Silk worm rearing contributes to the income of individuals and the economy of the country. Silk production through silk rearing could be a useful avenue for improving economy [2].

Silk production potential of the area is very low as compared with other parts of the world [4, 6]. This might be due to the ecological variation, rearing capacity or farming technique, awareness of people and availability of food plants to silk worms.

Regarding to the annual silk production potential among the study area, the higher was produced in Hawzen while the lower in Adigrat and Wukro silk production areas. This variation might be due to rearing or farming and other facilities variations among the silk production areas for instance in Hawzen, this sector is governed by Millennium Village Project and this project may deliver different facilities that support (helps) for high production of silk where as Adigat and Wukro are private sectors. The higher silk production potential in Hawzen area might be due to availability of different silk production facilities like the presence of available food plant, silk worm production material, best farming techniques and other factors that contribute for high production of the silk.

Table 2: Annual silk production and income of silk worm in eastern Tigray, Northern Ethiopia, 2014

Area	Type of silk worm	Silk Production /one time (kg)	Production cycle / year	Silk production / year (Kg)	Price of silk / 1kg	Annual Birr (ETB)
Adigrat	Mulberry	100 – 150	2 x	200 – 300	150	30,000 - 45,000
	Eri silk	50 – 60	2 x	100 – 120	70	7,000 - 8,400
Hawzen	Mulberry	150 – 250	2 x	300 – 500	180	54,000 - 90,000
	Eri	100 -130	2x	200-260	130	26,000 - 33,800
Wukro	Mulberry	100 – 120	2 x	200 – 240	150	30,000 - 36,000
	Eri	50 – 70	2 x	100 – 140	70	6,000 – 8,400

ETB = Ethiopian Birr, USD = USA Dollar

3.3 CONSTRAINTS OF SILKWORM RARING

According to respondents the major silkworm raring constraints were lack of food or host plants, drought, lack of knowledge such as training, lack modern house, lack of market availability, lack of governmental and nongovernmental support, lack wide area, lack of silk worm production materials and seasonal environmental condition fluctuation such as temperature decreases up to less than 10^0c especially from October to January, which allows leaving of plant leaf (Table 3). These problems may lead to poor quality and low amount of silk production. Because of the absence of food plant and lack silkworm farming knowledge the silk production potential of the silk worms are being affected. Despite the high rainfall in the area, silkworms produce silk twice per year and this finding is similar with different finding in different part of the world [4, 6, 13].

Most of constraints were common in Adigrat and Wukro silk production areas. This might be due to lack of governmental and nongovernmental support and consequently the silk production potential is also very low.

Table 3: Major constraints of silkworm production in Eastern Tigray, Northern Ethiopia, 2014

Constraints	Rank
Food plant	1
Drought	2
Knowledge (skilled man)	3
Modern house	4
Market	5
Financial support	6
Wide area	7
Silk production material materials	8
Others	9

4 CONCLUSION AND RECOMMENDATION

In the present study two types of silk worms namely, mulberry and eri silk worms were identified and mulberry silk worm was more adapted to the area. The main food or hosts were mulberry for mulberry silkworm and caster for eri silk worm, respectively. Mulberry silk worm produces higher kilograms of silk and income per year than eri silkworm. The major constraints were lack of wide area, food plant, silk worm production material, drought, modern house, knowledge and training, market, governmental and nongovernmental institutions that deliver support. Despite all the constraints, there are many opportunities and potential to increase production and quality of silk products in the area. The government and other concerned bodies need to have deliver training on silk worm farming, financial support to the private silkworm rears, make conducive conditions for market and alleviate the other major constraints for high production potential of silk at regional and federal level.

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