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Analyze the knowledge level of bivoltine technologies of trained and untrained sericulture (Rear to bombyx mori) farmers in Coimbatore districts, Tamil Nadu, India

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Abstract
Sericulture is an agro–based cottage industry and of the prominent enterprises involved in a series of on-farm, off-farm, and industrial activities. This study analyzes the knowledge level of bivoltine technologies by trained and untrained sericulture farmers in Coimbatore District, Tamil Nadu, India. The study was conducted with 300 trained and untrained farmers from the same district. Trained farmers (Batch-wise) underwent five days of training at Tamil Nadu Sericulture Training Institute, Hosur. The parameters were analyzed in trained and untrained farmers practicing Bivoltine technologies., *viz* 1. Knowledge level of Mulberry technologies *viz*., Soil testing and reclamation, Mulberry variety, spacing of plantation, Irrigation method, Pruning, Integrated nutrient management like farm yard manure application, Vermicompost and Biofertilizers application, green manure and Chemical fertilizers application, Integrated water management like Rain water harvesting set-up, Basin storage method, Water recharge setup, and farm ponds. Integrated Pest management like insecticide, and biological control. 2. Knowledge level of silkworm technologies *viz*., Separate Silkworm Rearing shed, Disinfection, shoot rearing, Moulting & spinning care, providing bed spacing, Applying Bed –Disinfection, Feeding per day 2 times, regulated temperature and humidity, Spinning care, Montage usage – collapse montages, IPM – Mechanical method, Uzi trap application, Uzi powder application and Biological control for (*Nesolynx thymus*) Cocoon harvesting at an appropriate time, transportation at the right time and marketing at right time.

Keywords: Mulberry, trained and untrained, silkworm, technologies, biological control.

Introduction
The sericulture industry with its rural-based activities and enormous generation potential has been recognized as one of the most appropriate avenues for socio–economic developing countries like India. Imparting sericulture knowledge to farmers is the prerequisite for changing their attitude, skills, and adoption level which are essential components of rural development (Gowda *et al.,* 1992) [6]. New technology and development and its proper dissemination play a vital role in the development and success of any agriculture / farm-based activity. Sericulture, an age-old traditional practice of rural India has become a successful occupation for the guest income at frequent intervals for two to three decades. The District Coimbatore is invested with a very pleasant and favorable environment condition, suitable soils, and rich rainfall for mulberry cultivation and silkworm rearing, and 1225 farmers cultivated 2838.25-acre mulberries (HHTK Policy Note 2022-23). Hence the present study was aimed at the following objectives, to analyze the Knowledge level of Mulberry technologies and silkworm technologies in Coimbatore District Trained and untrained farmers.

Materials and Methods
The study was taken up in the Coimbatore district of Tamil Nadu, where the majority of farmers rear bivoltine cocoons. The survey was conducted in selected five blocks of Periyanaickenpalayam, Karamadai, Alandurai, Annur, and Kinathukadavu in the Coimbatore district. The sample was drawn from the trainees who had undergone training at Tamil Nādu Sericulture Training Institute, Hosur during the period (From 2019 to 2020). Since the study is based on primary data sources at the farmer's level, it is proposed to collect data from two groups of farmers *viz*., Trained and untrained farmers who adopt new bivoltine sericulture technologies. From each group, 150 samples were collected and a total of 300 samples would be ultimately used in the study. Primary data formulated with well-defined objectives based on the interview schedule was prepared. In this, all relevant information was furnished to collect data from respective respondents in the study area. Data was collected on knowledge levels of bivoltine technologies. To analyze the knowledge, the level was classified as full knowledge (F), Partial knowledge (P), and No knowledge (N) and this study used the percentage and mean.

Result and Discussion
The data collected were presented in different tables and discussed below

Table 1: Analysis of Knowledge Level of Mulberry Cultivation (Trained farmers)

#	Mulberries Technologies	Sample	Knowledge level					
			Full (f)	%)	Partial (p)	%	Non (n)	%
1	Soil Testing and reclamation	150	97	64.66	32	21.33	21	14.00
2	Mulberry variety (V1, MR2, G4)	150	150	100				
3	Spacing (4x4,'5+3x2 ', 8x8')	150	131	87.33	19	12.66		

4	Irrigation method -Drip	150	89	59.33	48	32.00	13	8.66
5	Pruning (45 days -60 days)	150	102	68.00	48	32.0		
6	INM							
	1. FYM (8-10 MT)	150	130	87.00	20	13.0	0.0	0.00
	2.Vermicompost application	150	62	41.00	40	27.0	48	32.00
	3. Biofertilizers application	150	81	54.00	42	28.0	27	18.00
	4. Green manure application	150	85	56.70	42	28.00	23	15.33
	5. Chemical fertilizers	150	98	65.3	37	24.7	15	10.0
	6. Foliar application	150	95	63.33	35	23.33	20	13.33
	Pooled data	150.00	92	61.33	36	24	22	14.66
7	IWM							
	1. Rainwater harvesting set-up	150	108	72 .00	42	28.00	0	0
	2. Bain storage method	150	92	61.30	48	32	10	6.66
	3. Water recharge setup	150	83	55.33	46	30.7	21	14
	4. Farm ponds	150	86	57.33	38	25.0	26	17.3
	Pooled data	150	92	61.33	44	29.33	14	9.33
8	IPM							
	1. Mechanical methods	150	102	68	48	32		
	2. Insecticide Application	150	120	80	30	20		
	3. Biological control	150	74	49.30	59	39.30	17	5.6
	Pooled data	150.00	98	65.33	46	30.66	5.66	5.66
9	IDM- Mulberry	150	120	80	30	20		
10	Right time used leaf (Mulberry)	150	122	81.30	28	18.70		

Table 2: Analysis of Knowledge Level of Mulberry Cultivation (Untrained Farmers)

#	Mulberries Technologies	Sample	Knowledge level					
			Full(F)	%)	Partial (P)	%	Non (N)	%
1	Soil testing and reclamation	150	78	52.00	24	16.0	48	32.00
2	Mulberry variety (V1, MR2, G4)	150	129	86.00	21	14.0	0.0	0.00
3	Spacing (4x4,'5+3x2 ', 8x8')	150	110	73.00	40	26.66		
4	Irrigation method -Drip	150	71	47.33	60	40.0	19	12.66
5	Pruning (45 days -60 days)	150	92	61.00	51	34.0	07	5.00
6	INM							
	1. FYM (8-10 MT)	150	130	87.00	20	13.0	0.0	0.00
	2.Vermicompost application	150	62	41.33	60	40	28	18.66
	3. Biofertilizers	150	61	41.00	42	28.0	47	31.33
	4. Green manure application	150	65	43.33	62	41.33	23	15.33
	5. Chemical fertilizers	150	78	52.00	67	44.66	5	3.30
	6. Foliar application	150	61	41	60	40	29	19.00
	Pooled Data	150.00	76	50.66	52	34.00	22	14.66
7	IWM							
	1. Rainwater harvesting set-up	150	104	69.30	46	30.7	0	0
	2. Bain storage method	150	52	34.70	28	18.7	70	46.7
	3. Water recharge setup	150	63	42.0	46	30.7	41	27.3
	4. Farm ponds	150	86	57.3	38	25.0	26	17.3
	Pooled Data	150.00	76	50.82	40	26.27	34	22.82
8	IPM							
	1. Mechanical methods	150	98	65.3	52	34.7	0	0
	2. Insecticide Application	150	99	66.0	51	34	0	0
	3. Biological control	150	48	32	31	20.7	71	47.3
	Pooled Data	150.00	82	54.00	45	30.00	24	16.00
9	IDM- Mulberry	150	62	41	40	27.00	48	32
10	Right time used leaf (Mulberry)	150	110	73.33	40	26.66		

The knowledge level of mulberry cultivation is presented in Tables 4.1.1 and 4.1.2.

Soil testing and reclamation

A perusal of Table 4.1.1.and 4.1.2 revealed that the soil testing & reclamation in trained farmers were full knowledge (F) 64.66% followed by partial knowledge (P) 21.33% and no knowledge 14 %, untrained farmers had full knowledge (F) 52.00% partial knowledge (P) 16.00% and no knowledge 32. % So, it is known trained categories for the importance of soil test and reclamation. The findings were in line with the findings of Elumalai and Murugesh (2018) reported in the Dharmapuri district.

Mulberry variety

V1 and MR2 recommended variety for Coimbatore conditions. However, due to environmental resistant variety and high yield in mulberry. The data revealed that knowledge was trained in 100 % and untrained for 86% of full knowledge followed the partial knowledge in 14%. the study indicates that the trained farmers know of the benefits of using high-yielding and disease-resistant mulberry varieties. Untrained farmers to create awareness of the High yield of mulberry. The findings were in line with the

findings of Beula Priyadarshini and Vijaya Kumari (2013) reported 100 % of knowledge of the mulberry variety in the Chittoor district.

Mulberry planting spacing

Departments of sericulture and Central Silk board were recommended to vary spacing planting the mulberry like (4x4,4x2,5+3x2, 8x8') but trained farmers had full knowledge (F) of spacing was 87.33 % followed the partial knowledge (P) 12.66 %. and untainted category farmers (F) 73.33% and 26.66%, respectively. The mulberry planted methods were earlier reported by Meenal *et al*.,2006, Reported 100 % knowledge about mulberry spacing at Sathyamangalam taluk in the Erode district. Beula Priyadarshini *et al*., 2013 same kind of report given by 100 % knowledge got in Chittor district.

Irrigation method

The quality and quantity of leaves harvested from mulberry plantations for silkworm feeding depends upon the availability of soil water. Irrigation is essential for optimum leaf yield, without irrigation may survive, but the yield will be of inferior quality. irrigation almost doubles the yield. supplementary irrigation generally improves the health of the worm and increases the larval, cocoon, and shell weights. most of the country will be using the drip irrigation system, this system saves 40% water, electricity, and manpower. Irrigation in the study area is most preferred in drip irrigation, the study revealed that Trained farmers knew (F) 59.30% followed that (P) 32% and no knowledge 8.66%, and untrained farmers (F) had 47.33% knowledge level. (P) 40% No knowledge(N) of 12.66%. Trained farmers have proper usage of water and use in drip irrigation. The same kind of observation was done by Krishnamoorthy *et al.*,2015, who reported that 98 % of knowledge in udumalpet and 42% of Krishnagiri district about the knowledge of drip irrigation method.

Pruning method

The pruning method was popular in Kolar districts in Karnataka and Malda districts in West Bengal in India. In Japan and Russia, the whole pruning method is done with mechanical harvesters. In this method, the entire branch is harvested and used to feed worms after the III moult directly. this method saves labor in harvesting and also in feeding, spacing, and bed-cleaning operations. the hygiene condition of the rearing house is earlier to be maintained. This method prunes for 45 to 60 days, yearly 5-6 times. trained and untrained farmers knew (F) and 68% and 61% followed the partially (P) 42% & 34% and untrained farmers did not know (N) 5%. The findings were in line with the findings of Choudhury *et al*., (2017) [2] reported 73 % of knowledge of the Pruning method in the Aizawl District.

Integrated nutrient management

Farm yard manure

Farmyard manure application is the most traditional method in India. Fym is bulky organic manure prepared simply by storing cow / Buffalo dung, dropping off sheep, goats, Poultry, etc., being a bulky and cheap source of organic manure. Fym contains approximately 0.5% N,0.2% P_2O_5, and 0.5% K_2o. Fym application @ 8- 10 M/acre/year is recommended to be applied in two splits. This application trained and untrained farmers had awareness and the same level of knowledge of (F) 87% and followed by (P) 13%. The Clear indicates to fym application trained and untrained farmers knowledge is high level. earlier same kind reported by Mani *et al., (*2006) [13], and Beula Priyadarshini *et al.,* (2013).

Vermicompost application

Vermicompost is rich in plant nutrient enzymes, antibodies, plant growth hormone, and large beneficial microbial populations, which help to increase the quality and yield of mulberry leaves suitable for higher productivity of silk. Trained and untrained farmers wise (F) 41% and 41 %, the followed (P) 27 %, and 40% and no knowledge of (N) 32% and 18.66%. the trained and untrained same level of knowledge about the vermicompost application but untrained farmers had slightly improved in vermicomposting application. The same studies were analyzed the Hadimani *et al., (*2017) [7], who reported 32 % of knowledge about the vermicompost application of bivoltine technologies.

Biofertilizer application

Recommended to apply Azotobacter or Azosprillum @ 8kg /acre/year and PSB (Phosphorus solubilizing bacteria) @ 10 kg/acre/year along with 500kgs of well-powered FYM IN 5 Split which curtains use 25% of N&P Chemical fertilizers it respectively It. Biofertilizers are applied on 6 ^{6th} and 7th day after pruning. Trained and untrained farmers knew (F) 54% and 41% and followed the partial knowledge same level (P) 28 % and no knowledge 18 % and 31.33%. indicates this study trained farmers used applied biofertilizers application. The same studies were analyzed the Elumalai *et al*., 2018, who reported 64 % of full knowledge about the Biofertilizer application in Dharmapuri District.

Green manure application

Green manuring applications of Daincha and sun hemp are the short-duration leguminous crops recommended for black, and red soil respectively. About 8-10 kgs of the seed is sown per acre in the wider spacing between the rows. The green manure crops are incorporated into the soil before flowering. Trained and untrained farmers knew (F) 56.70% and 43.33% and followed the partial knowledge (P) 21 %, 41.33 and no knowledge same level 15.33 %. The study revealed that trained farmers had highly applied green manure application. The same studies were analyzed the Elumalai *et al*., (2018), who reported 66 % of full knowledge about the green manure application in Dharmapuri District.

Chemical fertilizer

Chemical fertilizer namely Ammonium Sulphate, Single Super phosphate, and Murate of potash CSR&TI recommended for alkaline soils @ 350:140:140 kg NPK/ha/year for the V1 Mulberry variety. Trained and untrained farmers knew (F) 65.30% and 52.00% and followed the partial knowledge (P) 24.70 %,44.66 and no knowledge same level 10% and 3.31%. Agriculture and horticulture crops the harvested once time or twice in year, but mulberry is harvested more than five times, so agriculture and horticulture crops do not need much more chemical fertilizer application. but sericulture must be put in chemical fertilizer application. Trained farmers periodically apply for chemical fertilizers. The same studies were

analyzed the Choudhury *et al*., (2017) [2], who reported 60 % of full knowledge about the chemical fertilizer application in Aizawl District, Harishkumar *et al* (2022) who reported 75 % of full knowledge about the chemical fertilizer application in Arsikere taluk of Hassan district (Karnataka)**.**

Foliar application

Mulberry cultivation practices additionally gave a foliar application, this application only boosts and simulates the growth. Trained farmers knew the foliar application in full (F) 63.33%, followed the 23.33 partial (P) and no knowledge of 13.33%. Untrained farmers knew the foliar application in full (F) 52.00%, followed the 44.66 partial (P) and no knowledge of 319.33%. so clearly the results trained farmers had more knowledge about foliar application. The same kind result given the Rathore and Dhakar (2012) found that (96.00%) of the trainee farmers implemented nutrient management, (92%) of trainee farmers plant to-plant and row-to-row distances.

Integrated water management (IWM)

IWM includes more method presence, this study took only four methods taken. *viz*., 1. Rainwater harvesting set-up 2. Bain storage,3. Water recharge setup 4. Farm pond. The trained farmers had Integrated water management in rainwater setup high respondents n=108 (72.00%) and followed the basin storage n=92 (61.33%), farm ponds n=86 (57.33), and water recharge in n=83 (55.33%). The untrained farmers had Integrated water management in rainwater setup high respondents n=104 (69.30%) and followed the farm ponds n=86 (57.33%), water recharge method n=63 (42.00%), and Basin storage method n=52 (34.70%). The study revealed that the Trained farmers have properly applied the knowledge about the IWM. Rathore and Dhakar (2012) found that (88.00%) of the trainee farmers implemented water management, Tamil Selvi and Balasubramanian (2019) the study revealed that the training must require farmers for water management techniques. this will help the farmer to cultivate a greater number of crops by using less quantity of water.

Integrated Pest Management (IPM)

IPM is most preferred for agricultural and horticulture crops to prevent the crop.in sericulture also prefer three methods 1. Mechanical methods, 2. Insecticide Application, 3. Biological control to prevent mulberry crop.

Mechanical methods

Mechanical methods are eco-friendly, easy control to pests, initial infestation in pest attack control, and no cost method also. This method of knowledge in trained farmers had full knowledge (F) (n=102),68% followed that partial knowledge in (P) (n=48), 32%. This method knowledge of knowledge in untrained farmers had full knowledge (F) (n=98), 65.30% followed that partial knowledge in (P) (n=52), 34.70%. untrained farmers. So clearly known both group farmers knew mechanical control methods.

Insecticide application

Integrated pest management a kind method in insecticide, trained farmers knew (F) 80.00%, followed by (P) 20.00%, Untrained farmers (F) 66.00%, followed by (P) 34.00%. From the study, it is revealed that trained farmers' usage of insecticide is high compared the untrained farmers. The same kind of observation was also made by Sandhiya *et al.*, 2019.

Biological method

This method is safe, eco-friendly, cheap, and long-lasting. trained farmers knew (F) 49.33 %, followed by (P) 39.33%, and no knowledge 5.6%. Untrained farmers (F) 32.00%, followed by (P) 20.70% and no knowledge 47.30%. They revealed that untrained farmers create knowledge of biological control of pests and frequently arrange for state departments to conduct more demonstrations. The study indicates that training farmers to implement biological control is the utilization of one living organism to control another is an age-old practice and since time immemorial, man has been using cats to control rats. The above results are in line with the findings of Krishnamurthy (2012), Hadimani *et al*., (2017) [7], Choudhury *et al*., (2017) [2] and Elumalai *et al*., (2018).

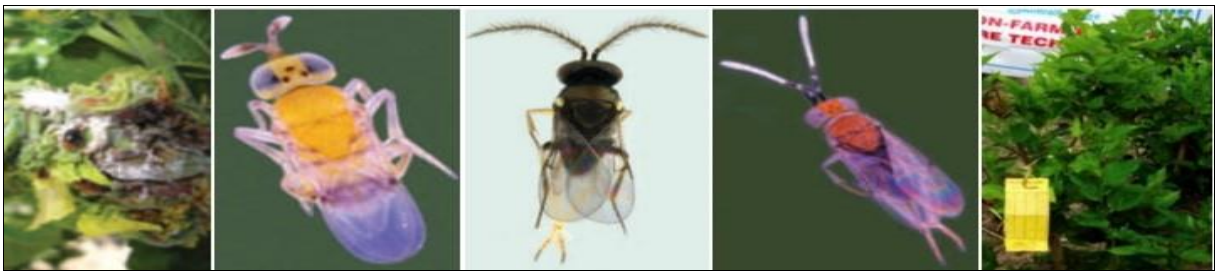

Fig 2: Mulberry parasitoid

Integrated Disease Management (IDM)

Preventing in better is the best method for all crops. IDM knowledge in trained farmers had(F) 80.00% followed the partial knowledge (P) 20% and untrained farmers had (F)41%, (P) 27.00%, and no knowledge in 32.00%. The study reported being untrained to create about in IDM. The above results are in line with the findings of Krishnamurthy (2012), Hadimani *et al*., (2017) [7], Choudhury *et al*., (2017) [2] and Elumalai *et al*., (2018).

Right time used leaf (Mulberry)

Mulberry leaves right time will used is better yield cocoon. knowledge in trained farmers had(F) 81.33% followed the partial knowledge (P) 18.70% and untrained farmers had (F)73.33%, (P) 26.66% The study on reported trained and untrained farmers had the same level of knowledge but slightly different presence in trained farmers. But all farmers right time used in mulberry leaves.

Table 1: Analysis of Knowledge Level of Silkworm Technologies (Trained farmers)

#	Silkworm Technologies	Sample	Knowledge Level					
			Full (F)	(%)	Partial (P)	%	Non (N)	%
1	Separate Rearing Shed	150	150	100				
2	Disinfection & Bed disinfectant application	150	150	100				
3	late age rearing- shoot rearing & feeding per day 2 times	150	150	100				
4	Mountage & Spinning care.	150	111	74.00	39	26.00		
5	Bed spacing	150	131	87.33	19	12.50		
6	Maintain temperature and humidify	150	112	74.66	38	25		
7	IPM in Uzi fly							
	1. Mechanical (net fixed in door and window)	150	124	82.66	26	17.33		
	2.Uzi trap	150	100	66.66	23	15.33	27	18.00
	3. Uzi power	150	101	67.33	30	20.00	19	12.66
	4. Biological –(*Nesolyx thymus)*	150	91	60.66	42	28.00	17	11.33
	5. Used sex pheromone	150	104	69.33	46	30.66		
	Pooled Data	150	104	69.33	33	22.00	13	8.66
8	Cocoon harvesting at the right time	150.00	134	89.00	16	11.0		
9	Transport at the right time	150.00	130	86.7	20	13.0		
10	Marketing at the right time	150.00	130	86.7	20	13.0		
11	IDM- Used Amruth	150.00	99	66.00	51	34.00		

Table 2: Analysis of Knowledge Level of Silkworm Technologies (Untrained farmers)

#	Silkworm Technologies	Sample	Knowledge level					
			Full (f)	%)	Partial (p)	%	Non (n)	%
1	Separate Rearing Shed	150	96	64.0	54	36	0	0
2	Disinfection & Bed spacing	150	97	64.6	36	24.0	17	11.3
3	late age rearing- shoot rearing & feeding per day 2 times	150	124	82.6	26	17.3	0	0
4	Mountage & Spinning care.	150	130	86.66	20	13.33		
5	Bed spacing	150	101	67.33	49	32.66	0	0
6	Maintain temperature and humidify	150	102	68.00	48	32	0	0
7	IPM							
	1. Mechanical (net fixed in door and window)	150	124	82.66	26	17.33		
	2.Uzi trap	150	100	66.66	23	15.33	27	18.00
	3. Uzi power	150	51	34.00	40	26.66	59	39.33
	4. Biological -*Nesolyx thymus*	150	43	28.66	42	28.00	65	43.33
	5. Used sex pheromone	150	68	45.33	46	30.66	36	24.00
	Pooled Data	150	77	51.33	36	24.00	37	24.66
8	Cocoon harvesting at the right time	150	124	82.66	26	17.33		
9	Transport at the right time	150	121	80.66	29	19.33		
10	Marketing at the right time	150	121	80.66	29	19.33		
11	IDM- Used Amruth	150	68	45.33	37	24.66	45	30.00

The knowledge level of mulberry cultivation is presented in Tables 4.2.1 and 4.2.2.

Separate rearing house

In the Coimbatore, district all the trained farmers have full knowledge and constructed the separate rearing houses, and untrained full knowledge (F) is 64% followed by partial knowledge in 36%. The importance of the separate rearing house for the successful silkworm crop was fully realized by both farmers in the study areas. Untrained farmers have heavy capital investment made the farmers desist from constructing the rearing house. This is substantiated by similar findings by Lakshmanan *et al.,* (1998), Kumaresan and Geetha Devi (2009) [11]., Hiriyanna *et al*.,2009, and Choudhury *et al*., 2017 [2].

Disinfection and bed spacing

Disinfection is a very essential prerequisite for successful silkworm rearing and an essential measure for disease prevention. The disinfection of rearing house appliances using bed disinfection practice of hygiene is the most essential activity for assured crop success and high cocoon yield. disinfection has to practice meticulously chemical disinfectant and separated rearing house with speared entry can be disinfected satisfactorily. Trained farmers had full knowledge about the disinfection and bed spacing (F) 100% and untrained farmers had a majority of farmers in full knowledge (F) 64.60%, followed the 24.00%. and no knowledge (N) 11.33. In trained farmers cent *per cent* of the sample farmers had full knowledge of technology fully which has been substantiated by the fact that crop failures in Coimbatore were almost nil. The kind results given by Deepa and Sujathamma (2007). Mohamed and Baldeo Singh (2003) pointed out that a large majority of the respondents had fully adopted the rearing of recommended high-yielding bivoltine races (90%) and time of disinfection (72%). Sreenivasa *et al*. (2005) reported that FYM was adopted by the maximum number of sericulturists (82.9%) followed by disinfection & hygiene (46.50%), in non-traditional areas of central Karnataka.

Shoot rearing and feeding

The advantages of shoot rearing especially the labor-saving nature were fully exploited by the trained farmers who had full knowledge (F) 100% but untrained farmers had a knowledge level of (F) 82.66%, followed by (P) in 17.33%. Mani (2006) reported that high adoption of shoot-rearing technology (100%) among the farmers in Erode district which is a neighboring district of Tirupur in Tamil Nadu.

Mountage & Spinning care

The improved montage plays a crucial role in the shape and quality of cocoons. Deepa and Sujathamma (2007) reported that the majority of the farmers know mounting care. All the farmers preferred plastic collapsible mountage due to the advantage of easy handling, cleaning, and the economy of space in storage. Above all the advantage of their use in self-mounting of the ripened silkworms during spinning made them adopt exclusively. The plastic mountage is spread on the rearing bed at the right time so that the worms crawl on them and build cocoons there by the labor involved is reduced. Usage of mountage and spinning care technique, the majority of untrained farmers have respondent full knowledge of (F) 86.66 % Following partially 13.33 %, farmers had a great experience. the trained farmers had full knowledge (P) 74.00%, and partial knowledge 26.00%.

Bed spacing

The importance of providing bed spacing for the uniform growth of the silkworm was fully realized by a vast majority of the trained farmers large majority of 87.33 % with full knowledge and followed partially by 12.50% and the untrained farmers with full knowledge by 67.33%, followed partially 32.66%, bed spacing which was physically seen during the study. The findings were in line with the findings of Meenal and Rajan (2006) reported that the sampled farmers had full knowledge of shoot rearing and bed spacing was adopted by 66% of the farmers. Beula Priyadarshini and Vijayakumar (2013) also reported that knowledge of silkworm in bed spacing full knowledge of 80% and partially 15% in the Chittoor district. Ovais Ahmad Hajam *et al* (2020) also reported that knowledge silkworm spacing 1.6% had full knowledge of and partially 98.33% had full knowledge of the Kother area of Anantnag districts of Kashmir.

Maintain temperature and humidity

The maintaining of temperature and humidity is the most important one of the silkworm rearing. Mysore, Central Sericultural Research & Training Institute recommended the 100 *per cent* crop success as a part of humidity and temperature in 37%. Temperature and humidity maintenance plays a very crucial role in the successful silkworm crop. Trained farmers The majority of farmers maintained the temperature and humidity properly and had full knowledge 74.66%, followed partially by 25%, untrained farmers had full knowledge 68% and 32%. The findings were in line with the findings of Krishmoorthy and Radhakrishnan (2012) who also reported that knowledge of silkworms in temperature and humidity in full knowledge of 75% and partially 25% at the Udumalpet area in Tamil Nadu.

Integrated Pest Management in Uzi fly

The pest Uzi fly (Exorista bombycis) is prevalent in the entire state of Tamil Nadu. Uzi fly controlled five methods. Trained farmers had full knowledge of (pooled) 69.33 % partial knowledge got in 22% and no knowledge about IPM 8.66%. Untrained farmers had full knowledge of (pooled) 51.33 % partial knowledge got in 24% and no knowledge 24.66% about IPM. IPM in trained farmers mechanical prevent and Uzi trap methods both in Coimbatore district same level, but Uzi power application, sex pheromone usage and biological control of (*nesolyx thymus)* very less to comparatively trained farmers. the study revealed that trained farmers had a majority of full and partial knowledge to comparatively untrained farmers. Untrained farmers frequently conducted awareness meetings in the study area.

Fig 2: Nesoynx thymus

The findings were in line with the findings of Krishmoorthy and Radhakrishnan (2012) who also reported that knowledge of silkworms in IPM in full knowledge of 53.8% and partially 19.3 and no knowledge of 26.90% in the Udumalpet area in Tamil Nadu. Beula Priyadarshini and Vijayakumar (2013) also reported that knowledge of silkworms in IPM full knowledge of 90% and partially 10% in Chittor district. Choudhury *et al*, (2017) [2] also reported that knowledge of silkworms in disease and pest management full knowledge of 73.4% and partially 20% and no knowledge of 6.70% in the Aizawl district of Mizoram.

Cocoon harvesting at the right time

Cocoon harvesting at the right time is a main part of sericulture. In the Coimbatore district trained farmers had full knowledge of 89% and some farmers followed partially 11.00% and untrained had knowledge of fully in 82.66% and followed 17.33%. observed the study trained and untrained farmers had had less same level of knowledge, but slightly the trained farmers so cocoon selling at high rates. This finding is in line with the findings of Hadimani *et al*. (2017) [7], who also reported that, 67 % of full knowledge in cocoon harvesting at the right time in the bidar district in Karnataka, India.

Transport at the right time

Transport at the right time is less level of inferior quality cocoons but transport is later to produce a lot of inferior quality cocoons formed. In the Coimbatore district trained farmers had full knowledge of 86.66% and some farmers followed partially 13.00% and untrained had knowledge of fully in 80.66% and followed 19.33%. The study observed that trained and untrained farmers have the same level of knowledge but slightly improved the trained farmers so cocoon selling at high rates. This finding is in line with the findings of Hadimani *et al*. (2017) [7], who also reported that, 67 % full knowledge in Bidar district in Karnataka, India.

Market at right time

Market at right time is all are right. In the Coimbatore district trained farmers had full knowledge of 86.66% and some farmers followed partially 13.00% and untrained had knowledge of fully in 80.66% and followed 19.33%. observed the study trained and untrained farmers had had less same level of knowledge, but slightly the trained farmers so cocoon selling at high rates.so untrained farmers to create awareness about marketing at bright times.

This finding is in line with the findings of Hadimani *et al*. (2017) [7], who also reported that, 78 % full knowledge in Bidar district in Karnataka, India.

Integrated Disease Management (IDM)

Integrated diseases management (IDM) for silkworm technique had Majority of trained farmers had a knowledge level of (F) 66%, followed that (P) 54%, Untrained farmers like (F) 45.33%, followed that (P) 24.66 % and no knowledge (N) 30%, Trained farmer used an and user – friendly botanical based formulated for suppression/control of grasseria and flacherie diseases and no crop failures. To create the aware in farmers, to upcoming year state and central sericulture research and training institute to create awareness of Amruth in study area.

Conclusion

The study revealed that the knowledge level of bivoltine technologies of the trained farmers was found to on the higher side when compared to untrained farmers. Trained farmers also have knowledge knew the mulberry cultivation like soil testing & reclamation, Mulberry variety, spacing of mulberry, drip irrigation, pruning technique, vermicompost production, Bio-fertilizer & green manure application, rain water harvesting setup, Basin storage, water recharge setup, farm ponds and biological control of pest. Untrained farmers more aware to the technique of mulberry cultivation in chemical fertilizer & farm yard manure application. Silkworm rearing technologies like, separate rearing house, shoot rearing, cocoon harvesting, transports at right, and marketing at right time the trained and untrained farmers group is high significant is presence. untrained farmers to educated in technique for disinfectant, moulting care, bed spacing, bed disinfection application and feeding.

The conclude the study majority of trainees have full and partial knowledge bivoltine technologies. Training is beneficial in reducing the constraints intensity and helpful in better dairy farming Tripp *et al*., (2005) [19] confirmed the importance of training in enhancing farmers skills in farming works, it is proven that training plays an important role in sericulture, thus, more training programme should be conducted periodically in the study area and making the farmers to attending these is utmost important. This study suggested to trained farmers every year once take the refresher training to update knowledge and untrained farmers should be attended the sericulture meetings, demonstration and exposure visit to improving knowledge. The Department of sericulture officials should be taking proper steps and suitable extension strategies to be followed for maximum knowledge of bivoltine technologies.

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