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Analyze the Adoption level of Bivoltine technologies of Trained and Untrained Sericulture (rear to *bombyx mori*) Farmers in Coimbatore Districts, Tamil Nadu, India.

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I. ABSTRACT

Introduction: Sericulture is an important recreation for the economic development of rural areas because of the high employment orientation, low capital investment, and remunerative production. **Materials and Method**: This study analyzes the adoption 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. **Results and Discussion:** The parameters were analyzed in trained and untrained farmers practicing Bivoltine technologies., viz 1. Adoption 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, farm ponds. Integrated Pest management like mechanical methods, insecticide, and biological control. 2. Adoption level of silkworm technologies viz., Separate Silkworm Rearing shed, Application of Disinfection and bed disinfection, shoot rearing and Feeding per day 2 times, Moulting & spinning care, providing bed spacing, regulated temperature and humidity, IPM – Mechanical method, Uzi trap application, Uzi powder application, used sex pheromone, and Biological control for (*Nesolynx thymus*) Cocoon harvesting at an appropriate time, transportation at the right time and marketing at right time.

Conclusion: The concluding study majority of trained farmers have full and partial adoption of bivoltine technologies.

KEYWORDS: Mulberry, Trained and untrained, Silkworm, Technologies, Biological control. 2.

II. INTRODUCTION

Sericulture is a welfare-oriented business with the potential for rapid and long-term economic growth (*Bhattacharya et al.,* 2019). This business is noted for its natural products, including cocoons and silk (*Kumar et al.,* 2019). 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. Sericulture training programs on the usage of new technologies are to be conducted periodically as and when new technologies are released for adoption.to ensure increased cocoon productivity with high technology adopted but also develop confidence in farmers' minds to go in for sericulture (Mani *et al*.,2006). Adoption of training helped farmers to a better option in the Udumalpet and Krishnagiri areas special attention is needed awards organize repeated training (Krishmoorthy and Radhakrishnan.,2012). The District Coimbatore is invested with a delightful 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 adoption level of Mulberry technologies and silkworm technologies in Coimbatore District Trained and untrained farmers.

III. 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). Untrained farmers were collected from the Assistant Director of Sericulture, Coimbatore office through the technical service center. 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 respondents in the study area. Data was collected on adoption levels of bivoltine technologies. To analyze the Adoption, the level was classified as full Adoption (FA),

Partial Adoption (PA), and Adoption (NA), and this study used the percentage and mean.

IV.RESULT AND DISCUSSION

The data collected were presented in different tables and discussed below,

Table 4.1. Analysis of Adoption Level of Mulberry Cultivation (Trained farmers)

#	Mulberries Technologies	Sample	Adoption level					
			FULL (FA)	%)	PARTIAL (PA)	%	NON (NA)	%
1	Soil Testing and reclamation	150	86	57.33	47	31.33	17	11.33
2	Mulberry variety (V1, MR2, G4)	150	150	100				
3	Spacing (4x4,'5+3x2 ', 8x8')	150	122	81.33	28	18.66		
4	Irrigation method -Drip	150	80	53.33	52	34.66	18	12
5	Pruning (45 days -60 days)	150	100	66.66	50	33.33		
6	INM							
	1. FYM (8-10 MT)	150	128	85.33	22	14.66		
	2.Vermicompost application	150	59	39.33	40	26.66	51	34.00
	3. Biofertilizers application	150	81	54.00	42	28.0	27	18.00
	4. Green manure application	150	82	54.66	42	28.00	26	17.33
	5. Chemical fertilizers	150	101	67.33	37	24.66	12	8.00
	6. Foliar application	150	79	52.66	35	23.33	36	24.00
	Pooled data	150.00	88	58.55	36	24.00	26	17.00
7	IWM							
	1. Rainwater harvesting set-up	150	105	70 .00	45	30.00	0	0
	2. Bain storage method	150	87	58.00	46	30.66	17	11.33
	3. Water recharge setup	150	71	47.33	57	38.00	22	14.66
	4. Farm ponds	150	92	61.33	33	22.00	25	16.66
	Pooled data	150	89	59.00	45	30.00	16	11.00
8	IPM							
	1. Mechanical methods	150	96	64.00	54	36.00		

	2. Insecticide Application	150	98	65.33	52	34.66		
	3. Biological control	150	67	44.66	59	39.33	24	16.00
	Pooled data	150.00	87	58.00	55	36.66	8	5.33
9	IDM- Mulberry	150	110	73.33	40	26.66		
10	Right time used leaf (Mulberry)	150	132	88.00	18	12.00		

Table 4.2 Analysis of Adoption Level of Mulberry Cultivation (Untrained Farmers)

#	**Mulberries Technologies**	**Sample**	**Adoption level**					
			Full(F)	**%)**	**Partial (P)**	**%**	**Non (N)**	**%**
1	Soil testing and reclamation	150	67	44.66	36	24.00	47	31.33
2	Mulberry variety (V1, MR2, G4)	150	126	84.00	24	16.0	0.0	0.00
3	Spacing (4x4,'5+3x2 ', 8x8')	150	106	70.66	44	29.33		
4	Irrigation method -Drip	150	70	46.00	56	37.33	24	16.00
5	Pruning (45 days -60 days)	150	91	60.66	51	34.0	08	5.33
6	INM							
	1. FYM (8-10 MT)	150	90	60.00	60	40.00	0.0	0.00
	2.Vermicompost application	150	68	45.33	60	40.00	22	14.66
	3. Biofertilizers	150	50	33.33	42	28.00	58	38.66
	4. Green manure application	150	55	36.66	58	38.66	37	24.66
	5. Chemical fertilizers	150	78	52.00	67	44.66	5	3.30
	6. Foliar application	150	49	32.66	54	36.00	47	31.33
	Pooled Data	**150.00**	**65**	**43.33**	**57**	**38.00**	**28**	**18.66**
7	IWM							
	1. Rainwater harvesting set-up	150	98	65.33	52	34.66	0	0
	2. Bain storage method	150	49	32.66	30	20.00	71	47.33
	3. Water recharge setup	150	60	40.00	46	30.66	44	29.33
	4. Farm ponds	150	86	57.33	38	25.33	26	17.33

	Pooled Data	**150.00**	**73**	**48.66**	**42**	**28.00**	**35**	**23.33**
8	IPM							
	1. Mechanical methods	150	88	58.66	62	41.33	0	0
	2. Insecticide Application	150	91	60.66	59	39.33	0	0
	3. Biological control	150	45	30.00	36	24.00	69	46.00
	Pooled Data	**150.00**	**75**	**50.00**	**52**	**34.66**	**23**	**15.33**
9	IDM- Mulberry	150	53	35.33	42	28.00	55	36.66
10	Right time used leaf (Mulberry)	150	101	67.33	49	32.66		

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

4.1.1. 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 adoptions (FA) 57.33% followed by Partial adoption (PA) 31.33% and no adoption (NA) 11.33%, untrained farmers had full adoption (FA) 44.66% partial adoption (PA) 24.00% and no adoption (NA) 31.33. % So, it is trained farmers for the importance of soil test and reclamation of two years once taken to soil test. The findings were in line with the findings of Elumalai and Murugesh (2018) reported in the Dharmapuri district and Harishkumar *et al*., 2022. The reported Arsikere taluk of Hassan district (Karnataka).

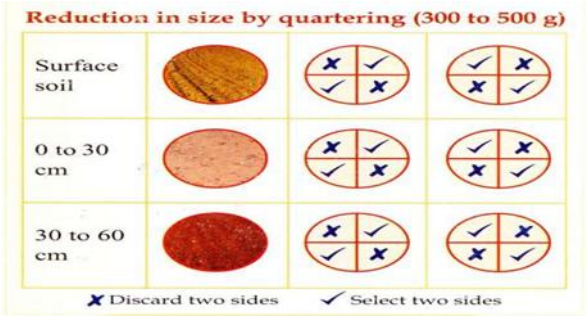

Fig 1 Soil test method

Fig 2 Mulberry plantation

4.1.2. 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 highly adopted were trained in 100 % and untrained for 84% of full adoption followed the partial adoption in 16%. 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), who reported 100 % Adoption of the mulberry variety in the Chittoor district, and Ravi Kant et al., (2023), who reported 66.67 for partially adopted in mulberry variety in Jammu region.

4.1.3. 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 adoption (FA) of spacing was 81.33 % followed the partial adoption (PA) 18.66 % and untainted category farmers (FA) 70.66% and 29.33%, respectively. The mulberry planted methods were earlier reported by Meenal *et al*.,2006, who Reported 94 % adoption of mulberry spacing at Sathyamangalam taluk in the Erode district. Beula Priyadarshini *et al*., 2013 same kind of report gave 60 % adoption in the Chittoor district.

4.1.4. 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. The study area is most preferred in drip irrigation, the study revealed that Trained farmers knew (FA) at 53.33% followed by (PA) at 34.66% and no adoption (NA) at 12%, and untrained farmers (FA) at 46% adoption level (PA) 37.33% No adoption (NA) of 16%. 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 75% of adoption in udumalpet, was about the drip irrigation method, and Harishkumar *et al*., 2022. The reported 41.67 % Arsikee taluk of Hassan district (Karnataka).

4.1.5. 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 fed to worms directly after the III molt. 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 (FA) and 66.66% and 60.66% followed

the partially (PA) 33.33% & 34% and untrained farmers did not know (NA) 5.33%. The findings were in line with the findings of Choudhury et al., (2017) reported 53.33 % of adoption of the Pruning method in the Aizawl District.

4.1.6. Integrated nutrient management

4.1.6.1. 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. In this application trained and untrained farmers had adoption of (FA) 85.33% & 60 % followed by (PA) 14.66% and 40%. The Clear indicates that fym application trained farmers' adoption level is high Earlier same kind was reported by Mani *et al., (*2006), and Beula Priyadarshini *et al.,* (2013),

4.1.6.2. 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 (FA) 39.33% and 45.33 %, followed by (PA) 26.66 %, and 40% and no Adoption of (NA) 34% and 14.66%. the trained and untrained same level of Adoption of the vermicompost application but untrained farmers had slightly improved in vermicomposting application. The same studies were analyzed the Choudhury *et al., (*2017), who reported 56.7 % of adoption of the vermicompost application.

4.1.6.3. Biofertilizer application

It is 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. Biofertilizers are applied on 6 ^{6th} and 7^{th} day after pruning. Trained and untrained farmers knew (F) 54% and 33.33% and followed the partial adoption same level (P) 28 % & 28% and no adoption 18 % and 38.66%. This indicates this study trained farmers in the proper use of applied biofertilizers. The same studies were analyzed by Elumalai et al., 2018, who reported that 45 % of the Partially Adopted the Biofertilizer application in Dharmapuri District.

4.1.6.4. 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) 54.66% and 36.66% and followed the partial adoption (P) 28 %, 38.66 and no adoption same level 17.33 and 24.66 %. The study revealed that trained farmers had highly applied green manure application. The same studies were analyzed the Elumalai et al., (2018), who reported 34 % of partial adoption of the green manure application in Dharmapuri District.

4.1.6.5. 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 (FA) 67.33% and 52.00% and followed the partial adoption (PA) 24.66 %,44.66 and no adoption same level (FA) 8% and 3.33%. Agriculture and horticulture crops are harvested once or twice a 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), who reported 23.33 % of the full Adoption of chemical fertilizer application in Aizawl District, Harishkumar *et al* (2022) who reported 56.7 % of the full Adoption of chemical fertilizer application in Arsikere taluk of Hassan district (Karnataka) and Harish Kumar et al., (2022) who reported 71.67 partially adopted in Jammu region.

4.1.6.6. 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 (FA) 52.66%, followed the 23.33 partial adoption (PA) and no adoption (NA)24%. Untrained farmers knew the foliar application in full (F) 32.66%, followed the 36% partial (PA) and no adoption of (NA) 31.33%. so clearly the results trained farmers had greater adoption of foliar application. The same kind result given the Rathore and Dhakar (2012) found that (96.00%) of the trainee farmers implemented nutrient management, (and 92%) of trainee farmers plant-to-plant and row-to-row

distances and Harishkumar et al., (2022) Fully adopted 13.33% and Partially Adopted the 21.67% in Arsikere taluk of Hasan District (Karnataka) about the foliar application.

4.1.7. Integrated water management (IWM)

IWM includes more method presence, this study took only four methods. 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=105 (70.00%) and followed the basin storage n=87 (58%), farm ponds n=92 (61.33), and water recharge set up in n=71(47.33%). The untrained farmers had Integrated water management in rainwater setup high respondents n=104 (65.33%) and followed the farm ponds n=86 (57.33%), water recharge method n=60 (40.00%), and Basin storage method n=44 (32.66%). The study revealed that the Trained farmers have properly applied the Adoption of the IWM. Rathore and Dhakar (2012) found that (88.00%) of the trainee farmers implemented water management, Tamil Selvi (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.

4.1.8. 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.

Fig 4 Biological control of (*pseudorendrothrips mori*) for Mulberry thrip

4.1.8.1. 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 Adoption in trained farmers had full Adoption (FA) (n=96),64% followed by partial adoption in (PA) (n=54), 36%. This method Adoption in untrained farmers had full adoption (FA) (n=88), 58.66% followed by partial adoption in (PA) (n=62), 41.33%. untrained farmers. So clearly known both group farmers knew mechanical control methods.

4.1.8.2. Insecticide application

Integrated pest management a kind method in insecticide, trained farmers knew (FA) 65.33%, followed by (PA) 34.66%, Untrained farmers (FA) 60.66%, followed by (PA) 39.33%. From the study, it is revealed that trained farmers' usage of insecticide is high compared to untrained farmers. The same kind of observation was also made by Sandhiya *et al.,* 2019.

4.1.8.3. Biological method

This method is safe, eco-friendly, cheap, and long-lasting. trained farmers knew (FA) 44.66 %, followed by (PA) 39.33%, and (NA)16%. Untrained farmers (FA) 30%, followed by (PA) 24% and (NA)46%. They revealed that untrained farmers create the adoption 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), Choudhury et al., (2017), and Elumalai et al., (2018) and Ravi Kant et al., (2023).

Fig 5 Mulberry parasitoid

4.1.9. Integrated Disease Management (IDM)

Preventing better is the best method for all crops. IDM adoption in trained farmers had (FA) 73.33% followed the partial adoption (PA) 26% and untrained farmers had (FA)35.33%, (PA) 28.00%, and no adoption (NA) in 36.66%. 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), Choudhury et al., (2017) and Elumalai et al., (2018) and Ravi Kant et al., (2023).

4.1.10. Right time used leaf (Mulberry)

Mulberry leaves right time will used is better yield cocoon. Adoption in trained farmers had (FA) of 88% followed the partial adoption (PA) of 12% and untrained farmers had (an FA) of 67.33%, (PA) of 32.66% The study on reported trained and untrained farmers had the same level of adoption but slightly different presence in trained farmers. But all farmers right time used in mulberry leaves.

Table 4.2.1. Analysis of Adoption Level of Silkworm Technologies (Trained farmers)

#	Silkworm Technologies	Sample	Adoption 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	138	100	12			
4	Mountage & Spinning care.	150	102	74.00	48	26.00		
5	Bed spacing	150	131	87.33	17	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 – (*Nesolynx 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	80	69.33	20	22.00	50	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	108	86.7	31	13.0	11	
11	IDM- Used Amruth	150.00	78	66.00	44	34.00	28	

Table .4.2.2. Analysis of Adoption Level of Silkworm Technologies (Untrained farmers)

#	Silkworm TECHNOLOGIES	Sample	Adoption level					
			FULL(F)	%)	PARTIAL (P)	%	NON (N)	%
1	Separate Rearing Shed	150	86	64.0	54	36	10	0
2	Disinfection & Bed spacing	150	66	64.6	43	24.0	41	11.3
3	late age rearing- shoot rearing & feeding per day 2 times	150	121	82.6	29	17.3	0	0
4	Mountage & Spinning care.	150	110	86.66	28	13.33	12	
5	Bed spacing	150	91	67.33	49	32.66	10	0
6	Maintain temperature and humidify	150	91	68.00	49	32	10	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 -*Nesolynx 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	53	51.33	34	24.00	63	24.66
8	Cocoon harvesting at the right time	150	121	82.66	29	17.33		
9	Transport at the right time	150	121	80.66	29	19.33		
10	Marketing at the right time	150	110	80.66	40	19.33		
11	IDM- Used Amruth	150	56	45.33	40	24.66	54	30.00

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

4.2.1. Separate rearing house

In the Coimbatore, district all the trained farmers have full Adoption and constructed separate rearing houses, and untrained full adoption (FA) is 64% followed by partial adoption (PA) at 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)., Hiriyanna *et al*.,2009, and Choudhury *et al*.,2017.

Fig 6 Separate rearing house

4.2.2. 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 adoption of the disinfection and bed spacing (FA) at 100% and untrained farmers had a majority of farmers in full Adoption (FA) 64%, followed by the (PA) 24.00%. and no adoption (NA) 11.33. In trained farmers cent *per cent* of the sample farmers had full adoption 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*. (2010) 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.

4.2.3. Shoot rearing and feeding.

The advantages of shoot rearing especially the labor-saving nature were fully exploited by the trained farmers who had full adoption (FA) 100% but untrained farmers had an adoption level of (F) 82.66%, followed by (PA) 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.

Fig 7 Shoot rearing and feeding *(Bombyx mori*)

4.2.4. 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 responded to full adoption of (FA) 86.66 % Following partially (PA) 13.33 %, farmers had a great experience. the trained farmers had full adoption (FA) 74.00%, and partial adoption (PA) 26.00%.

Fig 8 Spinning of cocoon

4.2.5. 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 (FA) and followed (PA) by 12.66% and the untrained farmers with full adoption (FA) by 67.33%, followed partially (PA) 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 Adoption of shoot rearing and bed spacing was adopted by 66% of the farmers. Beula Priyadarshini and Vijayakumar (2013) also reported that the Adoption of silkworm in bed spacing full Adoption of 75% and partially 15% in the Chittoor district. Ovais Ahmad Hajam *et al* (2020) also reported that adoption of silkworm spacing 1.6% had full Adoption and partially 95.00% had full adoption of the Kother area of Anantnag districts of Kashmir.

4.2.6. 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 is crucial in a successful silkworm crop. Trained farmers the majority of farmers maintained the temperature and humidity properly and had full adoption 74.66%, followed partially by 25%, untrained farmers had full adoption 68% and 32%. The findings were in line with the findings of Krishmoorthy and Radhakrishnan (2012) who also reported that the adoption of silkworms in

temperature and humidity in full adoption of 46.1% and partially 53.9% at the Udumalpet area in Tamil Nadu.

4.2.7. 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 adoption of (pooled) (FA) 69.33 % partial adoption got in (PA) 22% and no adoption of IPM (NA) 8.66%. Untrained farmers had full adoption of (pooled) 51.33 % partial adoption got in 24% and no adoption of 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 (*Nesolynx thymus)* very less to comparatively trained farmers. the study revealed that trained farmers had a majority of full and partial adoption to comparatively untrained farmers. Untrained farmers frequently conducted awareness meetings in the study area.

Fig -9 *Nesoynx thymus*

The findings were in line with the findings of Krishmoorthy and Radhakrishnan (2012) who also reported that the adoption of silkworms in IPM in full adoption of 53.8% and partially 19.3% and no adoption of 26.90% in the Udumalpet area in Tamil Nadu. Beula Priyadarshini and Vijayakumar (2013) also reported that adoption of silkworms in IPM full adoption of 90% and partially 10% in Chittor district. Choudhury et al, (2017) also reported that the adoption of silkworms in disease and pest management was full adoption by 73.4% and partially 16.6% and no adoption by 10% in the Aizawl district of Mizoram.

4.2.8. 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 (FA) of 89% and some farmers followed (PA)at 11.00% and untrained had the adoption of fully at 82.66% and followed at 17.33%. observed the study trained and untrained farmers had had less same level of adoption, but slightly the trained farmers so cocoon selling at

high rates. This finding is in line with the findings of Hadimani et al. (2017), who also reported that, 67 % of adoption and adoption in cocoon harvesting at the right time in the Bidar district in Karnataka, India.

4.2.9. 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 adoption of 86.66% and some farmers followed partially 13.00% and untrained had adoption of fully in 80.66% and followed 19.33%. The study observed that trained and untrained farmers have the same level of adoption 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), who also reported that 67 % of adoption in the Bidar district in Karnataka, India, and, Ravi Kant et al., (2023) reported that 62% of cocoon transport at right time in Jammu region.

4.2.10. Market at right time

Market at right time is all are right. In the Coimbatore district trained farmers had full adoption of 86.66% and some farmers followed partially 13.00% and untrained had adoption of fully in 80.66% and followed 19.33%. observed the study trained and untrained farmers had had less same level of adoption, but slightly the trained farmers improved in cocoon selling at high rates.so untrained farmers to create awareness about marketing at the right times. This finding is in line with the findings of Hadimani et al. (2017), who also reported that, 78 % knowledge and adoption in Bidar district in Karnataka, India.

4.2.11. Integrated Disease Management (IDM)

Integrated diseases management (IDM) for silkworm technique had a Majority of trained farmers had an adoption level of (FA) 66%, followed that (PA) 34%, Untrained farmers like (FA) 45.33%, followed that (PA) 24.66 % and no adoption (NA) 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 among farmers, upcoming year state and central sericulture research and training institutes to create awareness of Amruth in the study area.

Conclusion

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

They conclude the study majority of trainees have full and partial adoption of bivoltine technologies. Training is beneficial in reducing the constraints intensity and helpful in better dairy farming Tripp *et al*., (2005) 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 program should be conducted periodically in the study area and making the farmers to attending these are utmost important. This study suggested that trained farmers every year once take the refresher training to update their knowledge and adoption, untrained farmers should attend sericulture meetings, demonstrations, and exposure visits to improve their knowledge and adoption. The Department of Sericulture officials should be taking proper steps and suitable extension strategies for maximum knowledge and adoption of bivoltine technologies.

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