Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(5): 275-277

Received: 10-07-2019
Accepted: 12-08-2019

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Introduction of summer crop in west Dehradun: A study

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Abstract
Inspite of the fact that the climatic conditions of Uttarakhand are congenial for bivoltine silkworm rearing specially for district Dehradun but only spring silkworm crop is being exploited at farmer's level and autumn crop has yet to be stabilized. The main reasons, as observed, are high temperature, high humidity and bad quality of mulberry leaves during autumn rearing. The temperature and humidity prevailing during rearing season could be manipulated but the leaves quality needs to be improved for silkworm rearing. Keeping in view, summer crop has been taken for study. An average cocoon production was 40.02 kg and 36.66 kg /100 DFLs during summer season 2018 and 2019 respectively in West Dehradun. The farmers conducting silkworm rearing in summer season harvest mulberry leaves bloomed after spring crop harvest and again a fresh harvest during autumn season. This also affects on the performance of autumn silkworm crop and sericulture activity becomes remunerative with spring, summer and autumn crops in a row.

Keywords: Bivoltine, congenial, summer, silkworm

Introduction
Uttarakhand is the 27th state of the country carved out of Uttar Pradesh in November' 2000. It is situated in the western sub-latitude belt of the country between 28°43' and 31°28' north latitude and 77°35' and 81°02' east longitude. This Himalayan state has a long tradition and history of silk production. Captain Hutton introduced sericulture in the hills of Massourie in the year 1858 and Messer's Lister & Company took up commercial production in a village on Dehradun - Haridwar road, which was later named as "Resham Majri". Dehradun district is the main centre of mulberry silk production in the state. About 52% of total mulberry silk production comes from Dehradun district only. West Dehradun is major silk producing area of the district.

Only two silkworm crops are being taken in Doon Valley i.e., spring and autumn seasons. Inspite of the fact that climatic conditions are suitable for bivoltine rearing, only spring crop is being exploited at farmer's level and autumn crop is not yet stabilized due to many reasons. The quality of mulberry leaves is one of the most important factors governing the production of good cocoon crop [13]. It is general tendency of the silkworm rearers during spring season to harvest mulberry shoots during 5th instar of silkworm rearing for onward leaf plucking to feed the worms. It was observed, in the month of June, that sufficient mulberry leaves were available on mulberry trees which remain un-utilized for silkworm rearing and no pruning schedule was observed by majority of the farmers for autumn crop. Due to no crop during summer season, such mulberry leaves became over matured or of poor quality and affected adversely on cocoon production during autumn silkworm rearing. Hence, autumn silkworm crop is not sufficiently remunerative in the present scenario of the state. However, sericulture industry in Northern states of the country sustains mostly on mulberry trees existing road side, ward side, river banks and boundary plantation thereby forming a major source of foliage [5-7, 12]. Further, change of mulberry cultivation practice from bush to tree mode in Uttarakhand [11, 14], necessitates introduction of additional silkworm crop in between spring and autumn seasons. Such problems were also realized in Kashmir valley [2, 8]. In view of the above, it was felt to introduce additional silkworm crop in between spring and autumn season on left over mulberry leaf or fresh leaves with irrigation facility in West Dehradun. This may help the farmers to have quality leaf for autumn crop and sericulture activity becomes more remunerative.

Materials and Methods

Chawki rearing centres (CRCs) were / are established by the department to conduct young age (chawki) silkworm rearing. Chawki rearing is a crucial and delicate stage for success of silkworm crop. Silkworm seed of Multi x Bi (PM x CSR2) hybrids were obtained from NSSO, Bangalore. Chawki rearing was conducted at respective CRCs established in the area on prescribed temperature (26-28 ^{O}C) and humidity (80-85%) as per the recommended package of practices [4, 10] under close supervision of officers and technical staffs so as to improve the cocoon productivity. Chawki reared silkworms (after 3rd moult) were distributed to the identified beneficiaries to conduct late age silkworm rearing at their places under technical supervision of staffs and officers [4, 10] during summer season 2018 and 2019. After completion of the feeding period i.e., 22-24 days, ripped worms were mounted for cocooning and were harvested on 7th day of mounting. Data on rearing performance/parameters were collected and analyzed.

Results and Discussions

Sericulture activity of Dehradun district is divided in two areas of west and east Doon.14 Govt. mulberry farms are functioning in western part of Dehradun district (Table-01). The existence of the Govt. mulberry farms in the area is based on the suitability for chawki silkworm rearing for farmers of that particular area.

Table 1: Mulberry wealth at Govt. farm in West Dehradun

Name of the farm		Area (Acreage)
1	Ambari	8.65
2	Vikasnagar	34.18
3	Aduwala	4.00
4	Harbartpur	4.60
5	Laxmipur	7.90
6	Sahaspur	3.83
7	Selaqui	8.40
8	Jhajra	4.54
9	Bhagawanpur	26.65
10	Sabhawalaa	5.84
11	Singhniwala	4.11
12	Badripur	9.73
13	Nayagaon	8.91
14	Bhuddi	4.46

*Source: DoS, Uttarakhand

As major sericulture activities are being taken in west Dehradun area, hence trial of silkworm rearing during summer season'2018 was taken only in this area viz., Vikasnagar and Sighniwala. An average productivity of 40.02 kg/100 DFLs was observed during said season as shown in the Table-02. On the performance of summer crop'2018, it was decided to continue summer rearing during'2019. It was observed that in Vikasnagar, Sighniwala and Shabhawala area, an average cocoon production was recorded to 36.66 Kg/100 DFLs (Table-02). Further, it is apparent from Table-03 that the numbers of farmers have increased in the productivity range of 40.1 to 50.0 kg whereas 7.89% farmers have produced more than 60.0 kg/100 DFLs during summer season'2019. This may encourage the other farmers to take the additional summer crop. The summer crop is over in the month of June last/ first week of July and new foliage comes in times for next autumn crop. This may helps in improvement in autumn silkworm crop performance. It is inferred that those farmers who are not opting for mulberry pruning after spring crop should take summer crop and sericulture becomes more remunerative.

Table 2: Crop Performance during Summer Season in Dehradun

Year	Date of brushing	Centre	Hybrid	DFLs Reared	Cocoon produced (kg.)				Yield (kg/ 100 DFLs)
					Reeling	Double	Damage	Total	
2018	11/6/18	Vikasnagar	PM x CSR2	250	93.50	0.10	3.80	97.40	38.96
		Sighniwala	PM x CSR2	250	98.80	1.10	2.80	102.70	41.08
	Total			500	192.30	1.20	6.60	200.10	40.02
2019	06/6/19	Vikasnagar	PM x CSR2	300	69.00	0.00	5.50	74.50	24.83
	05/6/19	Sighniwala	PM x CSR2	325	121.80	0.50	8.30	130.60	40.18
	05/6/19	Sabhawala	PM x CSR2	375	152.90	2.20	6.40	161.50	43.07
	Total			1000	343.70	2.70	20.20	366.60	36.66

Table 3: Frequency Distribution

Range of cocoon production (Kg)	2018		2019	
	Number of farmers	% of farmers	Number of farmers	% of farmers
0.10 to 10.00	Nil	Nil	01	2.63
10.10 to 20.00	02	10	03	7.89
21.10 to 30.00	02	10	08	21.05
30.10 to 40.00	07	35	10	26.32
40.10 to 50.00	03	15	07	18.42
50.10 to 60.00	06	30	06	15.80

60.10 & above	-	-	03	7.89
TOTAL	20	100	38	100

The result of the present study is in accordance with the results obtained at North Kashmir during summer season'2006 [8]. Further, at the time of implementation of cluster development programme in Kashmir valley, summer crops were also undertaken in Tral and Bandipora clusters. The results obtained from cluster silkworm rearers were better [2] than the results obtained in North Kashmir [8]. A comparative study with 33 cluster and 30 non cluster silkworm rearers was conducted in Tral area during summer season'2015 and it was observed that the cluster farmers who have adequate infrastructure have harvested with an average cocoon yield 33.72 kg/100 DFLs whereas non cluster farmers have harvested 7.95 kg/100 DFLs in the same area [2]. The reasons behind the better results of cluster farmers may be the infrastructure developed under the programme and helped them to adopt the technologies as per the recommended package of practices [2]. This indicates that the required infrastructure is the prerequisite to harvest good cocoon crop [1, 3, 9]. Summer crop has many other advantages as the rearers are not pre-occupied during that period. However, the summer crop is being practiced on a limited scale as the said rearing depends on the left over leaf of the spring rearing or facilities of proper irrigation. The summer crop can be taken on a large scale only when sufficient leaf is available in the field after spring crop or fresh flush by irrigation.

Conclusion

The result of the present study is a convincing factor for the farmers to take an additional silkworm crop in between spring and autumn season thereby sericulture activity may be more profitable for the farmers of this area. Further, the present study helps to have quality mulberry leaf during autumn season and sericulture activity may be more remunerative than the present time in the Dehradun thereby improving the socio-economic conditions of the silkworm rearers. This also helps in motivating the other farmers to adopt sericulture activity.

Acknowledgement

Authors are thankful to the technical staffs of RSRS, Sahaspur and DoS officials and officers of Dehradun for their continuous help and support throughout the study**.** We are also thankful to the Member Secretary, Central Silk Board, Bangalore, and Director, Directorate of Sericulture, Govt. of Uttarakhand, Dehradun for their co-operations and valuable suggestions during the study

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