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Effect of Feeding Mulberry Leaves Raised In Intercropping with Legumes on Silkworm *Bombyx mori* L.

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Study on the effect of feeding mulberry leaves raised in intercropping with legumes on silkworm *Bombyx mori L.*was carriedout during the year 2012 at K.V.K. Chamarajanagar. Significantly more larval weight (38.36 g/10), ERR (91.6 %) and shorter fourth (5.13 days) and fifth instar larval duration (6.92 days) and better cocoon weight (19.38 g/10 cocoons), Pupal weight (15.86 g/10) and shell weight (3.51 g/10 shells) obtained in mulberry and soybean and least shell ratio percentage (15.46), filament length (734 m) and thicker denier (2.26) was obtained in sole mulberry. Least natural incidence of flacherie (1.33 %), grasserie (1.40 %) and muscardine (2.75 %) was noticed in mulberry and soybean intercrops.

Key words: Feeding mulberry leaves, legumes, Silkworm.

The silkworm *Bombyx mori* L. is a monophagous and highly domesticated insect. This mainly necessitates the production of mulberry leaf of suitable quality with high nutrition and adequate moisture content for the success of silkworm rearing and cocoon crop production on commercial scale. By feeding the leaves obtained from different intercropped (Viz., Cowpea, green gram, black gram, soybean and groundnut) plots revealed non-significant difference in mature worm weight and post cocoon parameters indicating to deleterious effect of intercrops on leaf quality[1].Further, intercropping of chilli in paired row system of V_1 mulberry plantation has no ill effect on silkworm growth and its economic parameters[2]. Keeping this point in view present investigation wasundertaken in pit system of AR_{12} mulberry to find out the effect of feeding mulberry leaves raised in association with legume crops.

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MATERIALS AND METHODS

The field experiment entitled effect of feeding mulberry leaves raised in intercropping with legumes on silkworm (*Bombyx mori L.)* was carried out during 2012-2013 at KVK Chamarajnagar.

Established two years old mulberry garden of AR_{12} mulberry variety recommended for alkaline soil conditions was selected using randomized complete block design (RCBD) with four replications.

The treatments details

T_1- Sole mulberry
T_2 – Mulberry + Cowpea
T_3 – Mulberry + Soybean
T_4 – Mulberry + Black gram
T_5 – Mulberry + Green gram

T_6 – Mulberry + Hebbal avare
T_7 – Mulberry + French bean

The gross and net plot sizes were 10 x 10 m and 8.6 x 8.6 m with 90cm x 90 cm spacing and common fertilizer dose of 300: 120:120 NPK kg/ha / yr for mulberry and for intercrops @ 25:50:50 NPK kg/ha/yr. The commercial multivoltine silkworm breed $PMXCSR_2$ was used for the study. As multivoltine races are suitable to hot and humid condition. Disease free laying (DFLS) were obtained from the Government grainage, Chamarajanagar for experiment. The chawki worms were reared in a paper trays (1.5ft x 1.5 ft) by feeding three times a day (8.00 AM, 2.00 PM and 8.00 PM) with tender leaves, whereas late age worms were fed three times a day (8.00 AM, 2.00 PM and 8.00 PM) with shoot lets of respective intercrops. Bed cleaning was done once, twice and thrice during I, II, and III instar, respectively by lifting waste leaves. Whereas, two times each in IV and V instar by lifting shoot lets. The ripe worms were handpicked and mounted on bamboo mountage @ 50 worms/30 cm^2 as per treatment and cocoons were harvested manually on 5th day of mounting.

RESULTS AND DISCUSSION

The fourth and fifth instar larval duration of PM x CSR_2 as influenced by different intercrops on mulberry registered significant difference. However, shorter fourth and fifth instar larval duration (5.13 days) and (6.92 days) when larvae fed with mulberry leaves raised along with soybean. (Table I). These results are in agreement with the findings of Majumdar (3) who found that larval duration reduced by application of K. This report

Table 1. Effect of legume intercropping in mulberry on performance of silkworm

Treatments	IV instar larval duration (days)	V instar larval duration (days)	ERR (%)	Fourth instar larval Wt.(g)	Fifth instar larval Wt. (g)
T1 Sole mulberry	5.33	7.43	87	20.25	31.2
T2 M + Cowpea	5.16	7.13	91.14	23.14	36
T3 M + Soybean	5.13	6.92	91.6	24.13	38.36
T4 M + Black gram	5.18	7.24	90.63	21.66	34.25
T5 M + Green gram	5.15	7.18	90.42	22.7	35.18
T6 M + Hebbal avare	5.2	7.33	89.5	22.69	33.29
T7 M + French bean	5.24	7.36	88.72	21.99	31.61
S.em ±	0.03	0.01	0.04	0.29	0.34
C. D. @ 5%	0.09	0.03	0.13	0.88	1.02

M – Mulberry
NS – Non significant

Table 2. Effect of legume intercropping in mulberry on cocoon traits of silkworm

Treatments	Cocoon weight (g)	Defective cocoon (%)	Pupal weight (g)	Shell weight (g)	Shell ratio (%)	Filament length (m)	Denier
T1 sole mulberry	16.78	3.62	14.19	2.59	15.46	682.6	2.43
T2 M + Cowpea	18.55	2.65	15.09	3.45	18.6	737.3	3.02
T3 M + Soybean	19.38	1.98	15.86	3.51	18.13	739.8	2.88
T4 M + Black gram	18.17	2.53	14.98	3.19	17.59	724.9	3.13
T5 M + Green gram	18.35	2.4	15.1	3.24	17.68	729.5	2.68
T6 M + Hebbal avare	18.54	2.3	15.45	3.1	16.71	735.6	2.96
T7 M + French beam	18.5	2.21	15.11	3.39	18.32	731.3	2.7
S.em±	0.14	0.12	0.14	0.11	0.64	0.52	0.28
C.D. @ 5%	0.43	0.35	0.43	0.33	1.92	1.57	0.83

M - Mulberry
NS – Non significant

Table 3. Effect on legume intercropping on natural incidene of diseases

Treatments	Flacherie			Grasserie			Muscardine		
	Third instar	Fourth instar	Fifth instar	Third instar	Fourth instar	Fifth instar	Third instar	Fourth instar	Fifth instar
T1 sole mulberry	2.5	2.8	3.1	1.7	2.3	2.4	2.9	3.6	4.1
T2 M + Cowpea	1.29	1.4	1.6	1.39	1.81	1.91	2.3	2.93	3.9
T3 M + Soybean	1.18	1.3	1.52	1.27	1.59	1.7	2.38	2.81	2.93
T4 M + Black gram	1.2	1.51	1.7	1.3	1.9	2	2.4	3.1	3.19
T5 M + Green gram	1.3	1.6	1.74	1.48	2	2.38	2.42	2.9	3.15
T6 M + Hebbal avare	1.51	1.82	1.85	1.5	2.1	2.11	2.48	3.39	3.67
T7 M + French beam	1.6	2.2	2.09	1.68	2.1	2.14	2.85	3.49	3.88
S.em±	0.02	0.02	0.12	0.05	0.08	0.05	0.03	0.03	0.06
C.D. @ 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS

M - Mulberry
NS – Non significant

related to Murugesh, (4) reported that the level of phosphorus and potassium was found to be higher in mulberry leaf raised with clusterbean (2.97 and 2.23% respectively) and cowpea (2.94 and 2.20%, respectively). Similarly, significantly higher ERR of PM x CSR_2 was noticed in mulberry intercropping with soybean (91.6%) followed by mulberry and cowpea intercropping system (91.1%). The present results are in conformity with Hadimani[5] observed a significantly higher ERR in mulberry intercropped with soybean when silkworms were reared by using mulberry leaf grown along with different legume crops like soybean, green gram and black gram.

The significant difference was observed in fourth and final instar larval weight. However, higher larval weight of (24.13 g) and (38.36 g) recorded in mulberry and soybean intercrops for fourth and fifth instar, respectively. Least larval weight was recorded in sole mulberry of (20.25 g) and (31.20 g) in fourth and fifth instar worms, respectively. (Table I). This clearly shows that increase in nutritional quality of leaf increases larval weight. In relation to this Sridhar Babu[6] who registered increased nitrogen content in the leaf harvested from mulberry garden intercropped with short duration leguminous crops.

Influence of different legume crops on mulberry and inturns its effect on cocoon characters was found to be significant, maximum cocoon weight (19.38 g), pupal weight (15.86 g) and shell weight (3.51 g) observed in mulberry and soybean intercrops. Higher defective cocoon percentage was noticed in sole mulberry. Highest shell ratio (18.49 %) and single filament length (766.00 m) recorded in mulberrry and cowpea intercrops. Significantly higher denier was recorded in mulberry and black gram intercropping system (Table II). Similarly, significantly least cocoon weight (16.78 g), pupal weight (14.19 g), shell weight (2.59 g), shell ratio (15.46 %), single filament length (734.10 m) and denier (2.26) was in T1 sole mulberry where there is no intercrops. These findings are conformity with Hadimani[5] who confirmed that when mulberry grown along with different legume crops and fed mulberry leaves to the silkworm recorded significant differences on cocoon characters.

Non-significant difference was observed with respect to natural incidence of diseases. However, least incidence of flacherie (1.18 %), (1.30%) and (1.52 %) recorded in mulberry and soybean intercrops for third, fourth and fifth instar respectively. Similarly, higher natural incidence of grasserie was noticed in sole mulberry (1.70%), (2.30%) and (2.40%) for third, fourth and fifth instar respectively. Least incidence of muscardine was noticed in mulberry and soybean intercropping system (2.38 %), (2.81 %) and (2.93 %) for third, fourth and fifth instar, respectively. (Table III). Similar results reported by Hadimani[5] who opined that incidence of flacherie, grasserie and muscardine in all the instar worms fed with mulberry intercropped with legumes was numerically less compared to sole mulberry without intercrops.

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