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EVALUATION OF SOME MULBERRY GENOTYPES FOR NUTRITIONAL CONSUMPTION PARAMETERS OF SILKWORM, *BOMBYX MORI* L. UNDER TEMPERATE CONDITIONS OF KASHMIR, INDIA

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ABSTRACT

The research trial was conducted at Division of Sericulture Crop Improvement, College of Temperate Sericulture, Mirgund, SKUAST-Kashmir during spring seasons. The three mulberry genotypes namely Kokuso-21, SKM-33 and Goshoerami were fed to silkworm right from brushing up to spinning of cocoons. Besides one control was also maintained throughout rearing period. In the current research study lowest ingesta (13.205 g) and consumption index (0.770) was recorded in Goshoerami fed silkworm batch. The digesta (8.743 g), approximate digestibility (66.209 %), reference ratio (2.959) and relative growth rate (0.177) were found to be significantly highest in Goshoerami fed silkworm batch.

Keywords **:** Evaluation, mulberry, genotypes, consumption index, *Bombyx mori*.

Introduction

The silkworm, *B. mori* is one of the most economically important insect in the world. The silkworm, *B. mori* belongs to order Lepidoptera and family Bombycidae. Silkworm undergoes complete metamorphosis. Larvae feed on the mulberry leaves (family Moraceae, genus *Morus*). The five instars take 25-30 days to complete at 23-25 °C and at the end of fifth instar, *B. mori* spins cocoons over a period and then pupates within the cocoons. The pupal stage lasts for about 10 days and after that adult is formed inside the cocoon. The adult moth softens the cocoon by excreting an enzyme called as cocoonase at one end of the cocoon and emerges out from the cocoon. The female moth after mating with the male moth starts egg laying and completes one generation in about 40-45 days. Food consumption and utilization of silkworm is influenced by many biotic and abiotic factors, of which temperature and humidity are the most important during silkworm rearing (Reynolds and Nottingham, 1985). Food attains paramount importance for regulating silkworm growth, development and silk yield in silkworms. Intake of food and production of silk in silkworms are very closely associated to nutritional factors. Influence of mulberry nutrition and feeding of egg albumen treated mulberry leaves has been found to have profound effect on the growth and development of silkworm larva (Islam *et al.,* 2020a, 2020b). Dietary efficiency in silkworms plays a key role for converting the consumed mulberry leaves to silk thread. Consumption of food depends on nutrition type, which in turn has direct relation with the silkworm weight, pupa, cocoon and shell weight and silkworm race (Ramadevi *et al.,* 1992; Shivakumar, 1995). The efficiency of conversion of ingesta and digesta into body biomass, cocoon and shell differs among the silkworm breeds due to mulberry varieties and seasons (Anantha Raman *et al.,* 1994). Rate of Insect growth depends on the capacity of food taken (Kaufman and Bayers, 1972) and absorption of nutrients of host plants (Deshmukh *et al*., 1977; Joshi, 1985).

Materials and Methods

The current research work was conducted at Division of Sericulture Crop Improvement, College of Temperate Sericulture, Mirgund, SKUAST-Kashmir in 2019 and 2020 spring seasons. Disease free layings of silkworm race (PAM-117) was incubated and brushed as per the standard rearing protocol (Anonymous, 2003). The rearing of silkworms was carried out right from hatching upto spinning of cocoons on three different mulberry genotypes *viz.,* Kokuso-21, SKM-33 and Goshoerami, besides one control was also kept for comparison. In each replication 100 larvae were kept throughout the rearing period. The following parameters were recorded and calculated by the formulae:

Ingesta (g)

It is the total fresh/dry weight intake of mulberry leaves by the silkworm larvae during the 5th instar up to spinning stage. It was calculated as:

Ingesta = Fresh or dry weight of leaf given – Fresh or dry weight of left over leaf

Digesta (g)

It is the total assimilated fresh/dry food from the ingesta of fresh/dry weight of mulberry leaves by silkworm larva during the 5th instar up to spinning stage. It was calculated as:

Digesta = Fresh or dry weight of leaf ingested – Fresh or dry weight of litter

Excreta (g)

It refers to the non utilized mulberry leaves in the form of litter from the ingestion of mulberry leaves by the silkworm and was calculated as:

Excreta = Ingesta – Digesta

Approximate Digestibility (AD %)

It directly refers to the assimilation efficiency of mulberry leaves and depends on the rate of passage of food through gut in the silkworm.

It was calculated by the formula:

$$AD = \frac{\text{Fresh/dry weight of digesta}}{\text{Fresh/dry weight of food ingested}} \times 100$$

Reference Ratio (RR)

It refers to the indirect expression of absorption and assimilation of food and expresses the ingesta requirement per unit excreta produced.

It was calculated by the formula:

$$RR = \frac{\text{Fresh/dry weight of Ingesta}}{\text{Fresh/dry weight of excreta}}$$

Consumption Index (CI)

It is related to the rate of intake of food to the mean larval weight during the feeding period of silkworm.

It was calculated by the formula:

$$CI = \frac{\text{Ingesta}}{\text{5th age mean fresh/ dry larval weight (g)} \times \text{5th age larval duration}}$$

Relative Growth Rate (RGR)

It refers to the larval gain biomass and shows the efficiency of conversion of food into larval biomass. It was calculated by the formula:

$$RGR = \frac{\text{Weight gained by the larva during feeding period}}{\text{5th stage mean fresh/dry larval weight (g)} \times \text{5th stage larval duration}}$$

Statistical analysis

The data was compiled and analysed and its significance was tested by the use of Annova table

Results and Discussion

The ingesta of silkworm varied significantly after feeding on different mulberry genotypes, highest ingesta was recorded in silkworm fed with SKM-33 (14.653 g) and lowest was recorded in Goshoerami (13.205 g) (Table 1) (Fig. 1). The current results are in conformity with the findings of Vijaya Kumari *et al.* (2003) who reported that CSR16 × CSR17 showed good performance when fed with less feed of mulberry leaves and resulted in better leaf cocoon ratio. The mulberry genotypes differed significantly with respect to digesta. Among these mulberry genotypes highest (8.743 g) digesta was recorded after silkworms were fed on Goshoerami leaves which was at par when compared to Control (8.742 g) (Table 1) (Fig. 1). The similar results were reported by Tzenov (1993) and Magadum *et al.* (1996) who stated that ingesta and digesta depends upon feeding level. According to Ramadevi *et al.* (1992) as the digestibility varies among different breeds so the ingesta and proportion of excreta also differs among different silkworm breeds. Our results corroborates with the research findings of Aftab Ahmad *et al.* (2000) who reported that higher ingesta does not necessarily lead to higher digesta in silkworms. The approximate digestibility varied significantly after feeding on different mulberry genotypes. Highest approximate digestibility (66.209 %) was recorded in Goshoerami fed silkworm batch and lowest approximate digestibility (48.570 %) was recorded in SKM-33 (Table 1) (Fig. 1). The approximate digestibility indicates the assimilation efficiency of mulberry leaves and is a racial character (Magadum *et al.,* 1996), however it is affected by nutritional deficiency, high amount of crude fibre and less water content in the mulberry leaves (Waldbauer, 1964). In present research study the significantly highest approximate digestibility was recorded in Goshoerami fed silkworm batch and differed from other genotypes. Our results are in agreement with the findings of Paul *et al*. (1992) who reported that approximate digestibility increases with the increase in moisture level of mulberry leaves. The significant difference was recorded in reference ratio and the silkworms fed with Goshoerami recorded highest reference ratio (2.959) and lowest was recorded in SKM-33 (1.944) (Table 1) (Fig. 2). The current research findings are in agreement with Rehmathullah *et al.* (2002) who analyzed three CSR silkworm races and reported significant difference with regard to reference ratio after rearing them under stressed conditions. The highest consumption index (0.798) was recorded in silkworm batch fed with SKM-33 mulberry genotype and lowest was recorded in Goshoerami (0.770) (Table 1) (Fig. 2). Our results are in line with Rehmathullah *et al.* (2006) who reported that any silkworm breed/hybrid is considered to be efficient in feed utilization unless its consumption index is kept low. The relative growth rate of silkworms showed significant difference after fed on different mulberry genotypes and highest relative growth rate (0.177) was recorded in silkworm batch fed with Goshoerami leaves, however lowest relative growth rate was recorded in SKM-33 (0.173) fed silkworm batch (Table 1) (Fig. 2). The present results are in agreement with Rehmathullah *et al.* (2006) who after analyzing two silkworm hybrids recorded highest relative growth rate in CSR16 × CSR17.

Table 1: Effect of different mulberry genotypes on nutritional consumption of silkworm

Genotypes	Ingesta (g)	Digesta (g)	Approximate digestibility (%)	Reference ratio	Consumption index	Relative growth rate
Kokuso-21	13.777[b]	7.653[b]	55.549[c]	2.249[c]	0.773[b]	0.175
SKM-33	14.653[a]	7.117[c]	48.570[d]	1.944[d]	0.798[a]	0.173
Goshoerami	13.205[d]	8.743[a]	66.209[a]	2.959[a]	0.770[b]	0.177
Control	13.448[c]	8.742[a]	65.005[b]	2.857[b]	0.772[b]	0.176
CD ($p \leq 0.05$)	0.084	0.051	0.029	0.017	0.014	0.001

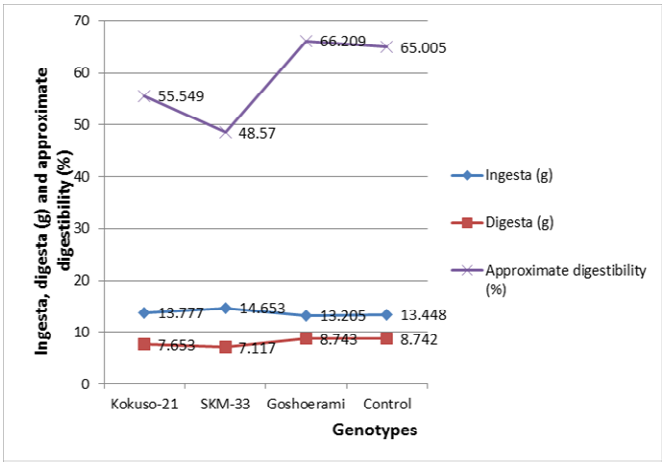

Fig. 1: Effect of different mulberry genotypes on ingesta, digesta and approximate digestibility of silkworm

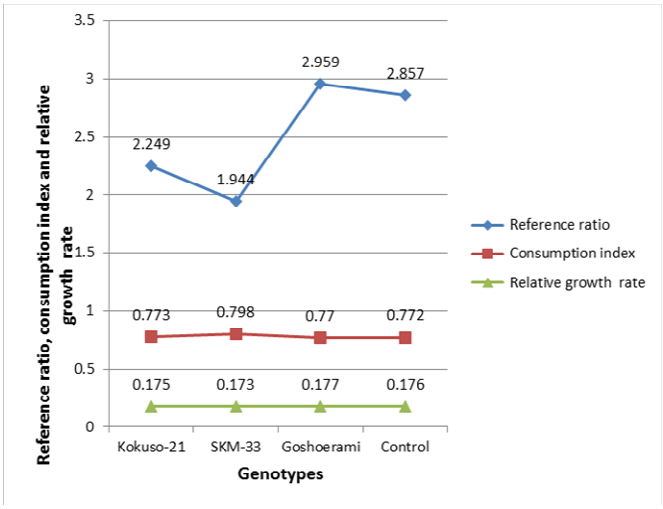

Fig. 2: Effect of different mulberry genotypes on reference ratio, consumption index and relative growth rate of silkworm

Conclusion

In the present research study Goshoerami fed genotype recorded significant improvement in parameters namely ingesta, digesta, approximate digestibility, reference ratio, consumption index and relative growth rate of silkworm as compared to other genotypes. Due to the high nutritional and moisture content present in the leaves of this genotype it significantly leads to improvement in the consumption parameters and therefore can be recommended for the rearing of silkworms from brushing upto spinning for the production of good quality cocoons.

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