BIOCHEMICAL COMPOSITION OF MULBERRY LEAVES

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Green mulberry leaves are the sole principle food of silkworm, which supply nutrients required for the normal growth of the silkworm. This sort of feeding on single host plant is termed as monophagus habit, of which the mulberry silkworm Bombyx mori is an example. The host specificity of the silkworm is mainly due to the presence of a yellow pigment attractant is called Morin, which is a pentahydroxy flavones. In the absence of these factors the larval feeding is inhibited.

Since the mulberry leaves are the sole food of silkworm, in a large economical scale in sericulture, the quality of the leaves have a direct bearing on the healthy growth of the larvae and quality of their cocoons. Quality of the leaves is decided by their physical and chemical properties. The later property has great significance in determining the nutritive value of the leaf. Mulberry leaf protein is the source to biosynthesis the silk, which is composed of two proteins namely fibroin and sericin. It has been proved that nearly 70% of the silk proteins produced by the silkworm is derived directly from the amino acids of mulberry proteins.

The chemical constituents of mulberry leaves bearing according to their habitat (soil), habit (tree, middling or bush type), climate, maturity of leaves and mulberry cultivars.

Analysis of various varieties of mulberry leaves for their nutritive value was found to contain the following in general.

Moisture (water)	70-75%
Protein	18-26%
Carbohydrates	25-30%
Minerals	10-15%

Water: water is a vital element for the body of mulberry plant and silkworms, since they serve to transport nutrients in the body.

Infant silkworms especially the first instar require more water and water requirement decreases gradually for grownup larvae. Since water content is one of

the most important factor for successful rearing of silkworm special attention must be taken to regulate the water content of mulberry leaves as food at every developmental stage of silkworm larvae.

Protein and Non Protein Nitrogenous Matters: according to the Japanese study, the main constituents of mulberry proteins are globulin, glutelin, albumin etc., and the amino acid component of mulberry proteins are glycine, alanine, valine, leucine, aspartic acid, glutemic acid, phenyl alanine, proline etc.,. In addition the non protein nitrogenous substance such as nitrates, ammonic compounds *etc*., Non nitrogenous content for nearly 22% of the total nitrogen in the young leaves.

Content of protein and non protein nitrogenous substances in mulberry leaves varies according to their maturity and environmental factors.

Carbohydrates: Carbohydrates of mulberry leaves are very important element for the healthy growth of silkworms especially during their infant larval stage. Carbohydrate content of the mulberry leaves varies a great extent, according to their environmental condition. Percentage of carbohydrate components in mulberry leaves are as follows.

Glucose and fructose – 2.5%, sucrose – 4.67 %, sugar in glycocytes – 0.35%, Maltose – 0.95%, Dextrin and starch – 4.65%, Pectin (in calcium salt) – 12%, pentosan – 3.84%, Fibers – 11.72%. it is seen that pectin occupies a greater part of carbohydrates especially in the matured leaves. But the pectin is useless as food for silkworm. Mulberry plant biosynthesize proteins directly from elements absorbed from mulberry leaf. Organic compounds of nitrogen combine in plants with carbohydrates or their derivatives to form proteins. Protein synthesis involves two steps. 1. Formation of amino acids from nitrogen and carbohydrate. 2. Protein synthesis from amino acids.

Fat: fat content is less in mulberry leaves but the silkworm synthesizes a large quantity of fat in their body from carbohydrates of mulberry leaf.

Ash: Several compounds like calcium, phosphorous, silicon, manganese, magnesium, iron, copper, zinc etc., are found in the ash which is responsible for the growth of the leaf. Calcium plays a important role in nitrogen metabolism of the

plants while its deficiency leads to poor absorption of nitrates. Calcium is found as calcium oxalate or a salt of pectin in the cell wall. Manganese is an important constituent of chlorophyll and plays a part in phosphate metabolism. Phosphorous is a important element of phosphoproteins of leaves. Iron is indispensible for the synthesis of chlorophyll. When the mulberry leaves are ingested by silkworms, the physiological alkalinity of food is related to the ash content. Thus ash in the mulberry leaves han an important growth to play as a food of silkworm.

Organic acids and Tannic acid: Oxalic acid, tartaric acid, citric acid and mallic acid are the organic acids found in mulberry leaves. Organic acid content is rich in tender leaves. Organic acid content is rich in tender leaves and the same decreases in the course leaves. The organic acid content varies from species to species.

The tannic acid content does not vary according to the maturity of the leaves but they show variation in different species of leaves. When the silkworms are fed with mulberry leaves containing rich quantity of tannic acid, the rearing results are found are found to be inferior.

Vitamins: Vitamins – A, B, C and D (ergosteron) are found in mulberry leaves. Vitamin C is rich in the leaves. It is found rich in plants grown under adequate sunshine, soil with rich phosphorous, fertilizers and in matured leaves.

Chloroplast Pigments: The chloroplast pigments are found in combination with chlorophyll, xanthophylls and carotenoid in the green leaves. These are two forms of chlorophyll namely bluish green chlorophyll A and yellowish green chlorophyll. These pigments are responsible for the coloration of the cocoons which are either white (bivoltines) or deep golden yellow (Nistari) and light yellow cocoons (Pure Mysore).
