BIOCHEMICAL ANALYSIS OF MULBERRY ASSOCIATED WITH INTERCROPPING OF MEDICINAL PLANTS UNDER TEMPERATE CLIMATIC CONDITIONS

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ABSTRACT

The Kashmir valley represents temperate climatic conditions and is known for its bivoltine sericulture. The sericulture in the region however, sustains on tree type of plants. Majority of Sericulturists in this traditional area have taken up mulberry cultivation on small land holdings as a life sustaining occupation. Other farmers with more land have taken it as subsidiary occupation. Mulberry is facing stiff competition from other economic crops. In order to make the mulberry cultivation more profitable and sustainable, intercrops can be practiced with them. Medicinal plants like Lavendula officinalis, Atropa belladonna and Echinacea purpurea are important source of alkaloids and essential oils, which have huge demand in pharmaceutical industry. The wider spacing available in the tree type of plantation of mulberry facilitates the cultivation of these medicinal plants as an intercrop. The present paper focuses on utilization of medicinal plants as an intercrop with mulberry to generate an additional income to the progressive farmers as the biochemical studies shows that there is no significant impact on mulberry leaf quality and soil health.

INTRODUCTION

Jammu and Kashmir is the only traditional sericultural state of India where mulberry exists from time and its leaves used as obliged source of feed to silkworms for the fabrication of silk. Majority of Sericulturists in the traditional areas of Kashmir depends on mulberry trees available on road sides. The successful adoption of mulberry Sericultural activities depends upon net returns. The farmers in this region (J&K) are usually reluctant to spare their land for mulberry plantation as they prefer other agricultural cash crops which provide them more income. Therefore, intercropping of mulberry with remunerative medicinal plants having high export potential can be promoted to optimize the production per unit area. Additional income can be generated simultaneously from the same land area by adopting intercropping of medicinal plants like Lavendula officinalis, Crocus sativus (Saffron), Atropa belladonna, Asparagus racemosus, Rosemarinus officinalis etc. with mulberry, without effecting mulberry yield potential and leaf quality. Besides, as per the market trend the cocoon price in the market remains is stable and rearing input cost within a period of time has gone up. Therefore, to strengthen sericulture, appropriate strategies needs to be adapted to raise economic status of farmer and sustainance of sericulture. As such, to improve the socio-economic status of farmers, it is envisaged to study the effect of intercropping of medicinal plants with mulberry in Kashmir valley. Selection of intercrops is an important factor. The adoption of appropriate medicinal plants considered for intercrop is based upon their low cost of production, higher sale value and their adaptability to temperate environmental conditions. Also, their planting and harvesting schedules are well synchronizing with mulberry cultivation practices. At CSR&TI, Pampore using soil Auger in a zigzag manner. The depth of sampling will be 0-30 cm. Composite sample was prepared using Quartering method. Samples were analyzed for pH and EC using digital pH and EC meter. The standard methods adopted for nutrient analysis were following:

1. Av. Nitrogen: (Subbiah and Asija, 1956)
2. Av. Potassium: (Hanway and Heidel, 1952)
3. Av. Phosphorus: (Olsen’s et al., 1954)
4. Micronutrients cations (Zn,Cu, Fe & Mn): (Lindsay and Norvell, 1978)

Biochemical analysis of Mulberry

The trees of Goshoerami were maintained according to recommended package and practices. The plant samples were harvested and dried in shade (except for chlorophyll analysis). These plant samples were then analyzed in laboratory. The standard methods adopted for biochemical analysis of plant material were:

1. Total Protein: (Bradford, 1976)
2. Total Carbohydrate: (Anthrone method by Hedge and Hofreiter, 1962)
3. Total Chlorophyll: (Arnon, 1949)

RESULTS AND DISCUSSION

The data recorded by analysis of soil samples didn’t showed significant differences among the treatments. The soil health
status in terms of Nitrogen, Phosphorus and Potassium revealed that the amount of macronutrients in the soil was lower in the intercropping plot as compared to control. But, the status was within the recommended limits (Graph 1). The pH status of the soil also remained constant in all the treatments (Table 1). The soil micronutrients (cations) status of control plot and intercropping plot showed that there is significant difference in Zn and Fe concentrations. However, these differences were in permissible limits (Graph 2). The mulberry plant leaf samples were analyzed for quality parameters. The data analyzed revealed that there was some impact of intercropping of *Atropa belladonna* and *Echinacea purpurea* on the mulberry leaf quality parameters. However, intercropping of the *Lavandula officinalis* does not pose any significant effect on mulberry leaf quality (Graphs 3, 4 & 5). The analysis of data has shown that the intercropping of medicinal plants with mulberry does not have significant effect on quantitative and qualitative parameters of mulberry. Also soil health status remains stable. If this technology is adapted by farmer, he can generate a handsome additional income from intercrop, when grown as intercrop with mulberry, has more potential in Kashmir valley as the net returns in comparison to the other crops are high.

**CONCLUSION**

Medicinal and aromatic plants are upstream elements of food, flavour and cosmetic industries. These plants can be cultivated in order to obtain essential oils and fragrant chemicals for commercial use. The demand for medicinal and aromatic plants is increasing day by day at national as well as international market. The plants experimented for intercropping with mulberry under temperate conditions of Kashmir has shown alluring prospects. Therefore, intercropping of medicinal plants with mulberry shall be advocated and adopted for obtaining additional remuneration for the farmers in this region.

**ACKNOWLEDGEMENTS**

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**REFERENCES**


**Graph 1:** Effect of intercropping on status of macronutrients in soil.

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![Graph 1: Effect of intercropping on status of macronutrients in soil.](image-url)
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Graph 2: Effect of intercropping on status of micronutrients in soil.

Graph 3: Effect of intercropping on protein content in mulberry leaf.

Graph 4: Effect of intercropping on protein content in mulberry leaf.
Graph 5: Effect of intercropping on chlorophyll content in mulberry leaf.

Table 1: Effect on soil pH and EC by intercropping.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>pH</th>
<th>EC (dS/m)</th>
</tr>
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<tbody>
<tr>
<td>With Lavender</td>
<td>7.32</td>
<td>0.28</td>
</tr>
<tr>
<td>With Atropa</td>
<td>7.62</td>
<td>0.32</td>
</tr>
<tr>
<td>With Echinacea</td>
<td>7.38</td>
<td>0.25</td>
</tr>
<tr>
<td>Control Mulberry alone (Goshoerani tree)</td>
<td>7.41</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Fig. 1: Intercropping of mulberry with A) Lavendula officinalis B) Echinacea purpurea and C) Atropa belladonna.