Performance of Intercrops in Mulberry Garden and Their Impacts on Quality Mulberry Leaf Production

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An investigation was carried out to know the effects of different intercrops viz., clusterbean, greengram, soybean, gingelly and cowpea on growth and yield parameters of mulberry, Morus alba L. The mulberry intercropped with clusterbean and cowpea recorded maximum number of branches per plant (14.00 and 12.25), number of leaves per plant (297.5 and 228.0) and shoot length (112.1 cm and 107.0 cm) and were found to be statistically superior over the mulberry without intercrop. Maximum leaf area index was registered in clusterbean (4.28). The leaf production of mulberry was boosted up by 13.40 and 11.25 per cent, when the clusterbean and cowpea respectively were intercropped. Similarly, higher leaf equivalent yield of intercrops was also observed in clusterbean (6736 kg/ha) intercropped situation.

Key words: Mulberry, intercrops, clusterbean, cowpea, quality, leaf yield

Mulberry (Morus alba L.) is cultivated with wider spacing which provides the scope for intercropping. Different crops, especially pulses have various beneficial impacts on crop plants besides enhancing the nutritional status of the soil by fixing atmospheric nitrogen. Kusiwar (1989) worked out the possibilities of raising intercrops in mulberry and revealed that leaf yield, shoot length, number of branches and leaves were increased when mulberry was intercropped with peanut. Tikader (1992) reported that short term high yielding and fast growing leguminous crops could be used for intercropping with mulberry. Studies have already been carried out towards supplementing the nitrogen requirement of mulberry through intercropping of different legumes (Ahsan and Dhar, 1989). Importance of intercropping in nitrogen budgeting and related aspects of mulberry cultivation has also been recognized (Sinha et al., 1987; Saraswath and Gupta, 1990). Keeping this in view, an attempt was made to efficiently utilize the available interspaces by cultivating intercrops.

Materials and Methods

The study was undertaken in the farmer’s field at Avinashi block of Coimbatore district using three years old mulberry garden with paired row of planting system [(150 x 90) + 60 cm]. The various short duration crops used as intercrops were clusterbean (45 x 15 cm), cowpea (45 x 15 cm), greengram (30 x 10 cm), soybean (30 x 15 cm), gingelly (30 x 30 cm) and coriander (20 x 15 cm) with plant population of 88425, 88425, 132640, 66310 and 198933 respectively in one hectare area. The mulberry was bottom pruned at two feet height and the seeds of intercrops were sown within a week after first and fourth pruning. The recommended dose of FYM and inorganic fertilizers for mulberry crop was applied before sowing of legumes and no fertilizers were applied to legume crops. Irrigation was given at weekly intervals to both mulberry and intercrops. The sunnhemp (green manure) was sown after third and sixth pruning and incorporated into the soil to augment organic matter content of soil. Cultural operations for mulberry were carried out with recommended package of practices (Krishnaswami, 1978). The experiment was laid out in a Randomized Complete Block Design with three replications.

The replicate plot size was five cents each. Soil was of red loamy type with pH of 6.8 and organic matter content of 0.5 per cent. Mulberry leaf was harvested 60 days after basal pruning and the economic parts of intercrops were harvested at their maturity stage. The observations on various biometric parameters of mulberry viz., average shoot length, number of branches/plant, number of leaves/plant, internodal length and leaf area index and mulberry yield were recorded. The yield of intercrops was also recorded and mulberry leaf equivalent yield was computed based on the prevailed market price of intercrop produces. The nutritional status of mulberry leaf viz., nitrogen (Humphries, 1956), phosphorus (Olsen et al., 1954) and potassium (Hanway and Heidal, 1952) were also estimated. The moisture content was calculated by gravimetric method and moisture retention capacity was estimated after 6 hours of leaf harvest. The data were analyzed by standard statistical procedure described by Panse and Sukhatme (1985).

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Results and Discussion

Growth parameters of mulberry

The growth parameters of mulberry are presented in Table 1. Maximum average shoot length (112.1 and 107.0 cm) and number of branches per plant (14.00 and 12.25) were registered in clusterbean and cowpea intercropped situation and were found to be statistically superior over all the other intercropped situations. This might be due to the enrichment of soil by leguminous crops through nitrogen fixation in the root nodules. Significant difference in shoot length and number of branches per plant when mulberry variety S13 was intercropped with greengram, blackgram, cowpea and soybean has been reported by Shankar et al. (1998). The beneficial effect of intercropping with pulses in mulberry garden has been well documented by Dayakar Yadav and Narendra Kumar (1991). These findings fall in line with the present observations.

Maximum number of leaves per plant (297.5) was recorded in mulberry grown with clusterbean as intercrop and significantly differed from all other treatments. This might be due to the fixation of atmospheric nitrogen in the soil by the intercrop which could have improved soil nitrogen status. Similar observations were recorded by Shankar et al. (1998), who studied the feasibility of intercropping pulses viz., cowpea, greengram, blackgram and soybean and reported a significant difference in case of number of leaves per plant (218.2) over the control plot (205.2).

The highest leaf area index of mulberry was recorded in clusterbean intercropped situation (4.28) followed by greengram (4.20) and were found to be on par with each other. This might be due to the release of more nitrogen to mulberry plants by root nodules disintegration. Similar observation was recorded by Dayakar Yadav and Narendra Kumar (1991) and Sridhar Babu (1994) when soybean was cultivated in mulberry garden as intercrop.

Moisture content and moisture retention capacity of mulberry leaf

The raising of different intercrops also exerted their influence on moisture content and moisture retention capacity of mulberry leaf significantly. Maximum moisture content was recorded in mulberry leaf intercropped with clusterbean (74.50 %) followed by cowpea (73.34 %) and were found to be superior to all other treatments (Table 2). This observation was strengthened by the findings of Ahsan and Dhar (1989) who recorded higher moisture content in mulberry raised with pulses as intercrop. The leaf of mulberry intercropped with clusterbean recorded highest moisture retention capacity (87.40 %) followed by cowpea (85.70 %) and were found to be statistically superior over the leaf harvested from mulberry raised without intercrop (73.40 %) (Table 2). The increased moisture content and moisture retention capacity are due to higher nutrient contents of leaves and keeping quality. This study can be corroborated with the observation of Bongale et al. (1998) who recorded maximum moisture retention capacity of leaf when the legumes were intercropped in mulberry garden.

Nutritional status of mulberry leaf

Biochemical analysis of leaf samples revealed positive impact of various intercrops on the nutritional status of mulberry. Significantly higher nitrogen content was recorded in mulberry leaf intercropped with clusterbean (3.84 %) and cowpea (3.81 %) over the mulberry grown without any intercrops (3.65 %) (Table 3). This result falls more or less in line with the observations of Sridhar Babu (1994) who registered increased nitrogen content in the leaf harvested from mulberry garden intercropped with short duration leguminous crops. Similar observation was reported by Bongale et al. (1998) with soybean as intercrop in mulberry garden. The level of phosphorous and potassium was found to be higher in mulberry leaf raised with clusterbean (2.97 and 2.23 %) than those with other intercrops.

Table 1. Growth parameters of mulberry on 60 days after pruning in different intercropping situations

<table>
<thead>
<tr>
<th>Intercrops</th>
<th>Average shoot length (cm)</th>
<th>Average number of branches/plant</th>
<th>Average number of leaves/plant</th>
<th>Average internodal length (cm)</th>
<th>Leaf area index (LAI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpea</td>
<td>107.0</td>
<td>12.25</td>
<td>228.00</td>
<td>5.18</td>
<td>4.13</td>
</tr>
<tr>
<td>Clusterbean</td>
<td>112.1</td>
<td>14.00</td>
<td>297.50</td>
<td>5.25</td>
<td>4.28</td>
</tr>
<tr>
<td>Soyabean</td>
<td>101.1</td>
<td>10.60</td>
<td>204.40</td>
<td>4.95</td>
<td>4.17</td>
</tr>
<tr>
<td>Greengram</td>
<td>105.4</td>
<td>10.05</td>
<td>217.68</td>
<td>4.80</td>
<td>4.20</td>
</tr>
<tr>
<td>Coriander</td>
<td>94.0</td>
<td>9.80</td>
<td>180.00</td>
<td>5.12</td>
<td>3.95</td>
</tr>
<tr>
<td>Gingelly</td>
<td>99.5</td>
<td>8.55</td>
<td>166.04</td>
<td>5.00</td>
<td>4.05</td>
</tr>
<tr>
<td>Sole Mulberry</td>
<td>97.0</td>
<td>9.35</td>
<td>181.60</td>
<td>5.00</td>
<td>4.00</td>
</tr>
</tbody>
</table>

F test: * * * NS *
S.E.m±: 2.16 0.72 7.31 0.98 0.07
CD (p=0.05): 4.25 1.13

Table 2. Moisture content and moisture retention capacity of mulberry leaf

<table>
<thead>
<tr>
<th>Intercrops</th>
<th>Moisture content (%)</th>
<th>Moisture retention capacity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpea</td>
<td>73.34</td>
<td>85.70</td>
</tr>
<tr>
<td>Clusterbean</td>
<td>74.50</td>
<td>87.40</td>
</tr>
<tr>
<td>Soyabean</td>
<td>68.28</td>
<td>74.52</td>
</tr>
<tr>
<td>Greengram</td>
<td>71.00</td>
<td>80.15</td>
</tr>
<tr>
<td>Coriander</td>
<td>63.32</td>
<td>76.24</td>
</tr>
<tr>
<td>Gingelly</td>
<td>68.15</td>
<td>76.90</td>
</tr>
<tr>
<td>Mulberry alone</td>
<td>62.71</td>
<td>73.41</td>
</tr>
</tbody>
</table>

F test: * NS
S.E.m±: 1.20 1.58
CD (p=0.05): 4.25 1.13


respectively) and cowpea (2.94 and 2.20 %, respectively) as intercrops than mulberry without intercrops (2.71 and 2.02 %, respectively) (Table 3). This may be due to the lack of competition for nutrient between main crop as well as intercrops and nitrogen fixation by intercrops which led to improvement in nutrient content of mulberry leaf. This view was supported by the findings of Tikader et al. (1992) and Hadimani (2003) who recorded significantly higher quantity of phosphorus and potassium in mulberry raised with pulses.

**Leaf yield of mulberry**

Among the different intercropped situations, clusterbean (5820 kg/ha) recorded maximum leaf yield followed by greengram (5712 kg/ha) and the least leaf yield was recorded in mulberry without intercrop (5134 kg/ha) (Table 4). This might be due to higher nutrient fixing ability of legume crops to the associated mulberry by improving soil fertility (Shukla et al., 1989). Moreover, the intercropping also suppressed the weed growth and ensured better mulberry growth and leaf production. Tikader (1992) reported that mulberry intercropped with field pea increased leaf yield (23,514 kg/ha) as against sole mulberry (21,908 kg/ha) with 7.33 per cent increase over the control. Shankar et al. (1994) reported the total mulberry leaf yield from five harvests at an interval of 60 days was superior when mulberry was intercropped with foxtail millet (17048 kg/ha) and soybean (14721 kg/ha) over the control. These findings are also in line with the present observation.

Among the various intercrops, clusterbean (6736 kg/ha) recorded the highest mulberry leaf equivalent yield and was followed by greengram (6570 kg/ha) (Table 4). This is due to the higher market price of greengram than all other intercrops. This result corroborates with the observations of Sinha et al. (1987) and Hadimani (2003) who recorded higher leaf equivalent yield when mulberry was raised with greengram and blackgram as intercrops. It is concluded from the present investigation that clusterbean and cowpea could be intercropped in mulberry garden for increasing the quality of mulberry leaves besides yield.

**References**


