PRODUCTION POTENTIAL, QUALITY AND CARRYING CAPACITY OF IMPROVED GRASSLAND VIS-A-VIS SILVIPASTORAL SYSTEM

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ABSTRACT
Effect of different treatments on production potential, quality and carrying capacity of improved grassland vis-a-vis silvipastoral system was studied. Introduction of Setaria anceps (setaria), setaria + Macroptilium atropurpureum (siratro) in native vegetation as well as in between hedgerows of Robinia pseudoacacia (Robinia) proved equally effective in relation to production. However, from over all quality point of view the letter one found better over all other treatments. All setaria introduced treatments benefits the farmers to carry almost three times more livestock with them.

INTRODUCTION
Himachal Pradesh occupies an area of 1.22 million hectares under meadows, permanent pasture and grasslands out of the total geographical areas of 5.57 million hectares. Besides, this grazing is also done in forest areas and private ghasnis is about 1.53 million hectares, thus making 2.75 million hectare area available for grazing (Anonymous, 1989). At present the level of dry matter production from grasslands and meadows is 2-3 t/ha having carrying capacity of 0.52 AU/ha/anum (Sharma et al., 1993). In spite of such a huge acreage, the state is deficient in dry, green fodder as well as in concentrates to the tune of 32, 82 and 99 per cent, respectively (Sood et al., 1995). The existing grassland of the state have been depleted and damaged to such an extent that if allowed any more in this condition, the sustenance of existing cattle population (5 million) may become difficult. Aggressive grass speices pose a serious problem in the development of livestock industry in the state. In order to maintain good cattle production, there must be a good quality fodder. The research on grassland improvement has been confined through the introduction of setaria and siratro (Sood and Singh, 1986 and Sood and Jaswal, 1993). However, performance of improved grassland and silvipastoral system has yet to be tested for mid hill region of Himachal Pradesh. Keeping this in view, the present study was, therefore, under taken to increase the production potential and quality of natural grassland vis-a-vis carrying capacity through the introduction of improved grass, legume and fodder tree species.

MATERIAL AND METHODS
Field experiment conducted during 1995-96 at Animal Nutrition Farm, College of Veterinary and Animal Sciences of Himachal Pradesh Krishi Vishvavidyalaya, Palampur to evaluate the effect of Macroptilium atropurpureum (siratro), Setaria anceps (setaria), setaria + siratro, setaria + siratro in between two hedgerows of Leucaena leucocephala and Robinia pseudoacacia in the natural grassland plus one control on forage yield, quality of the produce and carrying capacity using a randomised block design replicated thrice. The Imperata cylindrica (L) and Saccharum spontaneum (L) were the dominant grass species (74%), where as the legume component was practically absent. The soil was silty-clay-loam analysing 1.29 per cent organic carbon and 326.2, 8.7 and 351.0 kg of available nitrogen, phosphorus and...
potassium, respectively. Siratro was sown in rows 25 cm apart immediately after the first shower of monsoon. The rooted slips of setaria (2 slips/hill) planted in 50x 40 cm row and plant distance.

The plantation of siratro was done in between setaria rows. Leucaena/Robinia were planted in one metre wide row at a distance of 50 x 50 cm and setaria + siratro were introduced in between and either sides of two hedgerows. In the establishment year 40 kg N and 60 kg P₂O₅/ha was applied at the time of introduction. However, in the subsequent years 80 kg N and 60 kg P₂O₅/ha was applied. Crude protein was estimated by multiplying per cent nitrogen (Jackson, 1967) values by 6.25.

Cell contents = 100-NDF (Van soest and Moore, 1965)

\[
\text{Carrying capacity/ha/anum} = \frac{\text{Total dry matter production (kg)}}{\text{Dry matter intake (kg)/day/animal}} \times 365
\]

The pooled data of two years were statistically analysed (Clerke, 1994).

RESULTS AND DISCUSSION

Forage Yield: The mean forage yield of two years (Table 1) revealed that the introduction of siratro in the native vegetation enhanced the total biomass production significantly over control. The introduction of setaria (T₃), setaria + siratro (T₄), setaria + siratro in between two hedgerows of Leucaena (T₅) and Robinia (T₆), resulted in 43.7, 44.7, 39.3 and 42.7 t, respectively more fresh herbage yield over control plot (T₁). The corresponding increase in dry fodder yield was 9.8, 10.0, 8.3 and 9.6 tonnes. All setaria introduced treatments (T₃, T₄ & T₆) except (T₅) produced statistically similar fresh and dry forage yield. The performance of setaria in between Leucaena alleys was the poorest among all setaria introduced treatments, because of the poor adaptation of Leucaena. The dry matter production is not only the tool to assess the optimum growth and production level of the livestock but quality also.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Fresh forage yield (t/ha)</th>
<th>Dry forage yield (t/ha)</th>
<th>Crude protein content (%)</th>
<th>Cell content (%)</th>
<th>Dry matter intake/Heifer (kg/day)</th>
<th>Heifers/ha/anum</th>
<th>AU/ha/anum</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁ (Fertilized control)</td>
<td>16.2</td>
<td>6.9</td>
<td>4.6</td>
<td>27.2</td>
<td>3.5</td>
<td>5.4</td>
<td>2.7</td>
</tr>
<tr>
<td>T₂ (T₁ + Siratro)</td>
<td>20.4</td>
<td>6.5</td>
<td>6.9</td>
<td>29.3</td>
<td>3.8</td>
<td>4.6</td>
<td>2.3</td>
</tr>
<tr>
<td>T₃ (T₁ + Setaria)</td>
<td>59.9</td>
<td>16.7</td>
<td>5.7</td>
<td>32.3</td>
<td>3.1</td>
<td>14.5</td>
<td>7.3</td>
</tr>
<tr>
<td>T₄ (T₁ + Siratro)</td>
<td>60.9</td>
<td>16.9</td>
<td>5.8</td>
<td>32.7</td>
<td>3.4</td>
<td>13.5</td>
<td>6.7</td>
</tr>
<tr>
<td>T₅ (T₁ + Leucaena)</td>
<td>55.4</td>
<td>15.2</td>
<td>6.4</td>
<td>33.2</td>
<td>3.2</td>
<td>12.9</td>
<td>6.5</td>
</tr>
<tr>
<td>T₆ (T₁ + Robinia)</td>
<td>(0.98)</td>
<td>(0.23)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T₇ (T₁ + Pseudoscacea)</td>
<td>(3.02)</td>
<td>(0.78)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

CD (5%) 2.7 1.2 0.1 1.1 0.3

1 AU (animal unit) = 2 heifers
Note: Figures in parenthesis indicate the yield of fodder trees.

Quality of the produce: Introduction of siratro in the resident vegetation produced herbage with (6.9%) higher crude protein content followed by T₆ and T₅ treatment over rest of the treatments. Herbage obtained from setaria + siratro in between two hedgerows of Robinia (T₆) had (6.7%) higher crude protein content among setaria introductions. Introduc-
tion of setaria, setaria + siratro and tree components (T5 & T6) had marked influence on increasing the cell contents of the herbage over control and siratro introduction in native grass species (T2).

**Carrying capacity:** Introduction of setaria (T3), setaria + siratro (T4), setaria + siratro in between two hedgerows of Leucaena (T5) and Robinia (T6) benefit the farmers to carry almost three times (Table 1) of animals carried by control and T2. Although T3 treatment resulted in higher number of animal unit/ha/anum, but from over all quality point of view the introduction of setaria + siratro in between hedgerows of Robinia (T6) found to be the best introduction in the natural grassland. The treatment registered significantly higher crude protein (6.7%) and cell contents (34%) over all setaria introduced treatments.

**REFERENCES**


