be noted here that Rao et al. (1) just suggested an approximate chromosome number of 36. However, these authors could not make a detailed analysis of chromosomes. The chromosomes could be broadly grouped into five types, namely, A, A', B, B' and C. The karyotype formula is \( 2n = 36 = 2A + (4A' + 3A') + 3B + 3B' + 1C \) (Figs. 1 and 1a). The types A, A' and B, B' are with mostly submedian and subterminal primary constrictions respectively. Of these A' and B' types are small in size as compared to the types A and B (Fig. 1a). Moreover, types A', B and B' are represented by two identical and one with slightly different morphology. The type C is represented by a single chromosome and easily distinguishable by its smaller size and median primary constriction. The chromosome length ranges from 13.84 to 4.23 \( \mu \)m.

The presence of three chromosomes in each of the three different types (Fig. 1a), which are more or less similar in respect to their size and position of primary constriction, may not necessarily indicate their homology till detailed meiotic analysis is carried out. The karyotype pattern showing such diversity amongst chromosome pairs along with a single small metacentric chromosome studied from a large number of cells clearly indicate the extent to which structural alterations have been effective in their evolution. Such alterations have been maintained possibly due to the vegetative reproduction of the species.

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### EFFECT OF PRE-PRESS HOT WATER TREATMENT IN PROCESSING OF VEGETATION FOR LEAF PROTEIN

From the experience of fractional heat coagulation of leaf extracts, it was assumed that a hot water treatment of green vegetation may coagulate certain protein within the intact tissue, and, that subsequent processing may yield better quality products, viz., extracted leaf protein concentrate (LPC) with more of cytoplasmic material and the pressed residue (PR)
# Table I

*Some analyses of leaf protein concentrates*

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Treatment</th>
<th>Ash (%)</th>
<th>Nitrogen (%)</th>
<th>Ether (%)</th>
<th>Total lipids</th>
<th>Carbohydrates</th>
<th>Polypeptides</th>
<th>Available lysine</th>
<th>Methionine</th>
<th>Tryptophan</th>
<th>Invitro N-digestibility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Control</td>
<td>4.1</td>
<td>9.78</td>
<td>12.88</td>
<td>21.9</td>
<td>2.8</td>
<td>0.7</td>
<td>0.80</td>
<td>5.30</td>
<td>1.8</td>
<td>2.25</td>
</tr>
<tr>
<td>2.</td>
<td>60° - 1 min.</td>
<td>6.3</td>
<td>8.92</td>
<td>11.53</td>
<td>18.6</td>
<td>2.4</td>
<td>0.5</td>
<td>0.95</td>
<td>5.35</td>
<td>1.8</td>
<td>2.30</td>
</tr>
<tr>
<td>3.</td>
<td>80° - dip.</td>
<td>6.8</td>
<td>8.81</td>
<td>11.31</td>
<td>20.2</td>
<td>2.1</td>
<td>0.3</td>
<td>0.95</td>
<td>5.35</td>
<td>1.8</td>
<td>2.30</td>
</tr>
</tbody>
</table>

* (Per cent, moisture free basis)  

(g/16 g N)  

(%)  

* Excerpted from a Ph.D. Thesis.*
with more of nitrogen (N) than from the untreated green vegetation.

Preliminary trials of green vegetation of lucerne (Medicago sativa) with hot water of different temperatures, showed that the extractability of dry matter (DM) and nitrogen (N) progressively decreased both with increasing temperature of treatment and with increasing holding time at one temperature. The protein N to total N ratio in the juice showed a sudden fall on holding for greater than 1 min at 60°C and on even 0.5 min holding at 65°C, evidently due to activated autolysis of the proteins.

From the preliminary results, two hot water treatments (i) 60°C-1 min, and (ii) 80°C-dip were selected.

Results of one set of control and the two hot water treatments respectively showed dry matter extractabilities of 34, 25 and 22% and the pressed residue nitrogen was 2.85, 3.60 and 3.82% of dry matter, with the original vegetation containing 3.9% of dry matter. The corresponding yields of LPC dry matter were progressively lower as (1.43-1.65), (0.7-0.85) and (0.36-0.33) per cent respectively of fresh vegetation.

Various analyses of the three LPC samples (see Table I) showed no significant differences, but for sudden increase in ash and in leaf proteins from pre-press hot water treatments. This was possibly due to adherence of the extraneous dust to the hot water swollen plant tissue, otherwise washed off with water at room temperature. Preliminary tests with rats on LPCs of control and the (60°C-1 min) pre-press hot water treatment gave the values of 75 and 77% for apparent digestibility, 89 and 90% for true digestibility, and 82 and 76% for biological value respectively.

Our results did not support the assumption of preferential heat coagulation of chloroplastic material in the intact tissue. Evidently the heat treatment caused a coprecipitation of all proteins inside the tissue, yielding an extracted LPC more or less similar to that from untreated vegetation. However, hot water treatment did lead to a higher pressed residue nitrogen than the control and, therefore, apparently a better quality material as a fodder.

Central Food Technological Research Institute, Mysore, July 13, 1979.


CHROMOSOME NUMBER OF TRIGONELLA SPINOSA

Trigonella spinosa is one of the important wild species of genus Trigonella of Papilienacae. The present work is the first report on the somatic and meiotic compliments of this species.

![Fig. 1. Somatic cell showing 2n = 16 chromosomes, × 1,750.](image)

For somatic studies root tips were pre-treated in satu. solution of P.D.B. (Paradichlorobenzene) for 4 hr. and fixed in 1:3 acetic-alcohol for overnight, stained in aceto-orcein NHCL (9:1) mixture and finally squashed in 45% acetic acid. For meiotic studies...