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 ½ min holding at 65° C, evidently due to activated autolysis of the proteins[2].

From the preliminaey results, two hot water treatments (i) 60°–1 min. and (ii) 80°–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 (1·45–1·65), (0·7–0·85) and (0·36–0·53) per cent respectively of fresh vegetation.

Various analyses[3–9] of the three LPC samples (see Table I) showed no significant differences, but for sudden increase in ash and in leaf proteins from prepress hot weter 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[10] on LPCs of control and the (60°–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 pre ferential 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.

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## CHROMOSOME NUMBER OF *TRIGONELLA SPINOSA*

*Trigonella spinosa* is one of the important wild species of genus' *Trigonella* of Papilionaceae. 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.

For somatic studies root tips were pre-treated in sat. 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 anthers of suitable sizes were fixed in 1 : 3 acetic-alcohol and squashed in 2% Aceto-carmine. Diagrams were made from temporary preparations.

The Somatic compliment (Figs. 1–2) shows $2n = 16$ including two long chromosomes with secondary constriction—Type A—12 long to medium chromosomes with nearly median to submedian centromere—Type B and Type C with 2 short chromosomes with nearly submedian centromere.

The range of chromosome length is 1·16–2·00 mμ.

Karyotype formula : 2A + 12B + 2C.

Meiosis was normal showing regularly 8 bivalents at diakinesis (Fig. 3) and metaphase I.

FIG. 2. Idiogram showing 16 chromosomes.

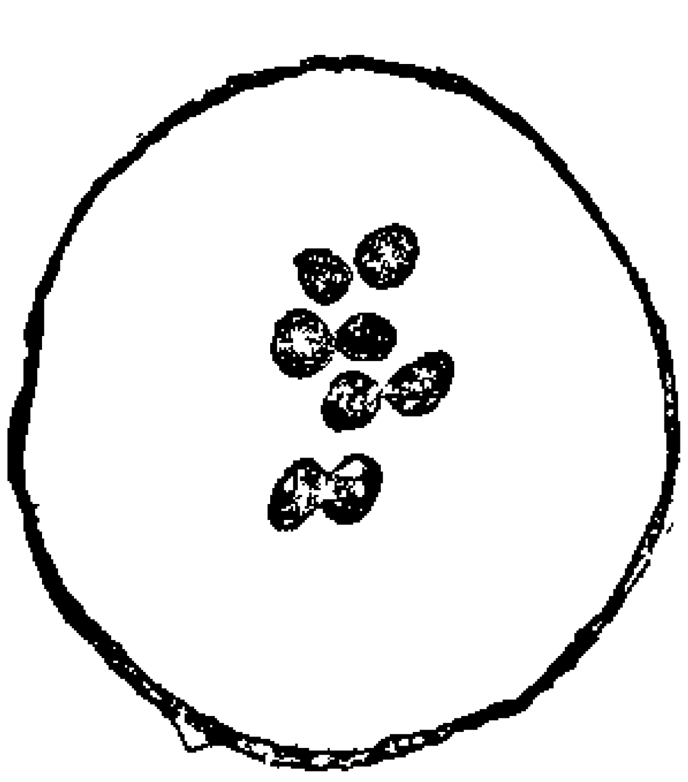

FIG. 3. Metaphase I showing regular 8 bivalents, × 1,500.

In the genus *Trigonella* a majority of the species have $2n = 16$ chromosomes[1–3], showing the primary basic chromosome number X = 8. The lowest chromosome number in the Papilionaceae is 5, the modal numbers are 7, 8, 11 and 24 and highest is 90[4]. But X = 8 is the most prevalent basis chromosome number. Thus *T. spinosa* is normal diploid spacies of genus *Trigonella*.

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## INTRODUCTION OF 'GEREEN *AZOLLA*' BIOFERTILIZER IN INDIA

PHOTOSYNTHETIC biofertilizers have drawn considerable attention on a global scale during the recent years to harvest both solar energy and atmospheric nitrogen for increasing crop production. *Azolla* having *Anabaena* symbiont in leaves is gaining importance due to its rapid growth, $N_2$-fixation in the flooded fields, ability to grow along with rice crop, fast decomposition, rapid availability of its N to the rice plants and also its ability to control weeds while growing in planted fields, among others. The researches carried out at CRRI are very encouraging and it is evident from the large scale cultivation and utilization trials that its use will help the developing countries to overcome the problem of low N and organic matter fertility in rice soils to some extent[1,2]. The annual production of *Azolla pinnata* (Indian isolate) at CRRI farm is around 347 tons green material/ha containing 868 kg N (average of 3 years trials), and increase in rice yield due to its application ranged from 0·5 to 2 tons/ha with moderate level of *Azolla* green manuring or dual cropping[3–6]. During a single crop it provides 20–50 kg N/ha, and it is also used with chemical N fertilizer to obtain higher yields. *Azolla* plants are edible and can be consumed both as feed and food[4,7].

One of the important aspects in the utilization of *Azolla* technology is the selection of suitable variety(s). The *A. pinnata* commonly found in India, grows well but turns reddish at high temperature, high light intensity and during phosphorus deficiency under the field conditions. The other isolates of *A. pinnata* collected from Bangkok, Bangladesh, Indonesia and Nepal grow well but turn reddish/pinkish under these conditions. However, the Bankok isolate grows better during winter than the Indian isolate. The other species, *i.e.*, *A. mexicana* and *A. filiculoides* isolated from USA grow poorly and may not be suitable for cultivation under Cuttack conditions.

One of the strains of *A. pinnata* isolated from Vietnam grew well (Table I) and remained green at high temperature, high light intensity, and with low or no application of phosphorus under the field condition. This strain has been repeatedly tested and is being cultivated now at large scale since June 1979 when day/night water temperature and light intensity were 38·4/30° C and 360·0 cal./cm²/day respectively with the production of 400–600 kg of fresh material/day. It has been introduced in the *kharif* crop in about 10 acres and further areas are being covered. It also grew better than the Indian isolate on floating blue-green algae in planted fields. It grows well even without phosphorus application, unlike the other *Azolla* isolates, and its ventral lobe remains whitish whereas the same is generally pinkish in other strains. This *Azolla* is sometimes attacked by insects as in other