SYMPOSIA

THE TOWNSVILLE LUCERNE SYMPOSIUM:† A REVIEW

by
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The symposium made it abundantly clear that research has made great progress in resolving some of the problems of pasture improvement through the use of Townsville lucerne and superphosphate in north eastern Australia. A substantial body of soundly based information is already available which can be extended with confidence and on which the cattle industry can readily draw for improving animal nutrition.

The symposium highlighted a number of shortcomings in our understanding of this plant with regard to limitations to its growth and reproduction, its mineral nutrition, its associated grasses, its use in animal production, its methods of establishment and the economic considerations associated with its integration into beef producing enterprises.

INTRODUCTION

The earliest published record in Australia documenting the virtues of Townsville lucerne goes back to 1914 when reference was made to the high feeding value of this plant. The date of its introduction into north-eastern Queensland is obscure. However, early in the present century favourable comments were made on its ability to improve the carrying capacity of land. Its use as an improved pasture has been the subject of extension activity as early as 1918. Comparative species evaluation commenced in 1933 and experimentation continued in numerous sites in eastern Queensland.[1]

The tempo of research has been greatly accelerated during the last decade and a need arose for penetrating debate on those issues where substantial progress in resolving problems in pasture improvement is being made. The symposium had as its primary aim the provision of a forum for personnel in the C.S.I.R.O. and the Queensland Department of Primary Industries engaged either in research or extension of Townsville lucerne, principally north of 20°S latitude in north-eastern Australia.

A total of 40 papers were received from 29 authors and these ranged widely over a broad spectrum of subject matter dealing with Townsville lucerne.

The proceedings were directed along six principal themes: These were:

(i) Limitations to growth and reproduction;
(ii) Nutrition of Townsville lucerne;
(iii) The grass-legume association;
(iv) Animal production and utilization;
(v) Agronomic method; and
(vi) Integration and economic considerations.

Papers on related topics within each theme were abstracted and presented by collators in plenary session. This was followed by general discussion. In addition, group discussions were held on themes (iii) and (iv) and a panel discussion on theme (vi).

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[1]HUMPHREYS, L. R. (1967). — Townsville lucerne: History and Prospect. Jnl. Aust. Inst. Agric. Sci. **33**: 3.

In conclusion, the proceedings of the symposium were reviewed for the two-fold purpose of (i) establishing the confidence research and extension specialists have in the phenomena they observe and the extrapolation thereof into practice, and (ii) indicating guidelines along which research could proceed to be assured of maximum applicability to animal nutrition problems in tropical Queensland.

ASPECTS ON WHICH A LARGE MEASURE OF CONFIDENCE EXISTS AND WHICH COULD BE READILY TRANSLATED INTO PRACTICE

1. Townsville lucerne is highly productive and will persist in many soil-vegetation regions in North Queensland. However, tree regrowth will be an important problem where clearing of dense stands of timber is carried out.

2. Landholders can be confident of the benefits of pasture improvement through Townsville lucerne and the use of superphosphates (super, Mo super etc.) in areas of coastal Queensland of which Rodd's Bay, Marlborough, Swan's Lagoon and Lansdown are representative. These areas comprise in excess of 10 million acres.

3. In eastern Queensland north of the 20°S latitude the grey-earth ti-tree woodlands, the solodic-podzolic complex, the yellow-earth Eucalyptus woodlands and the deep granitic sands are eminently suitable for the development of Townsville lucerne based pastures.

4. Productivity of Townsville lucerne is normally greater on the deeper, sandier-surfaced soils than on others.

5. Superphosphate is an almost universal requirement on all soils for high Townsville lucerne productivity. In comparison with other tropical legumes like Siratro and greenleaf desmodium, Townsville lucerne has a lower phosphorus requirement and is more tolerant of low potassium.

6. Townsville lucerne is more strain specific for daylength than for temperature in flowering response.

7. Late-flowering Townsville lucerne types are recommended for the area north of a line drawn through Cooktown, Musgrave Station and Mitchell River Mission Station and in higher rainfall coastal areas as far south as the tropic. Mid-season and early-season flowering types are suited to areas south of this line. Both late and midseason and also midseason and early flowering strains of Townsville lucerne could be sown to exploit specific microhabitats and different rainfall distributions.

8. Untreated seed of Townsville lucerne can be a carrier of weed seeds such as *Sida* and *Hyptis*.

9. Spear grass, native annual grasses, *Urochloa mozambicensis* and American buffel grass exhibit a reasonable degree of compatability with Townsville lucerne at Charters Towers and Marlborough — and Birdwood buffel at Katherine, in the Northern Territory.

10. Heavy grazing over a short period is beneficial to Townsville lucerne establishment, while continuous overgrazing leads to reduced vigour of the grass component and soil erosion.

11. Townsville lucerne will extend the period over which cattle will gain weight and superphosphate will increase the daily rate of liveweight increment. Steers can thus be turned-off earlier and at several times the stocking rate usual on unimproved native pasture.

12. The phosphate content of unfertilized Townsville lucerne pastures when grown on phosphorus deficient soils is often below the minimum animal requirement and a phosphorus rich supplement will then have to be provided to bring the animals into positive phosphorus balance.

13. A stocking rate of one steer to 2 acres at Lansdown and 3 acres at Parada and Swan's Lagoon and one steer to 4 acres at Marlborough is too heavy for cattle to maintain condition during seasons with poor rainfall. On the other hand there is evidence to suggest that doubling the normal stocking rate seems a safe starting point.

14. In areas receiving more than 30 inch annual rainfall under intensive development with small paddocks and tightly controlled mating, breeders grazing at one to 6 acres of Townsville lucerne fertilized pasture have a high calving rate and losses from nutritional causes are unlikely.

15. In grazing experiments stocking rates are used as tools for studying plant and animal interaction. They often have luxury levels of fertilizer application and should not be extrapolated into commercial practice without due qualification.

16. Over 100 lb nitrogen per acre per year was added to the soil/plant system by Townsville lucerne fertilized with 3 cwt superphosphate per acre over four years at Lansdown.

17. Some properties may require other forms of development such as fencing, stockyards, and stock watering facilities and timber treatment before large scale pasture improvement is embarked upon. Even on such properties small areas under Townsville lucerne will be a considerable aid in mitigating stock losses if managed to greatest advantage.

18. For the landholder, the alternatives in pasture improvement are the following:

(i) Better management of native pastures;
(ii) The introduction of Townsville lucerne into depleted native pastures;
(iii) The introduction of improved grasses into areas almost exclusively under Townsville lucerne; and
(iv) In areas where growth of native vegetation is poor introduction of both Townsville lucerne and a grass or grasses.

ASPECTS WHICH MERIT FURTHER INVESTIGATION

1. Perennial grasses are needed which are compatible with Townsville lucerne in the different climatic-soil-vegetation provinces.

2. There is a need for defining the factors involved in grass/legume associations and their effect on the stability and longevity of Townsville lucerne based pastures. The effect of other herbaceous and woody vegetation on improved pastures should also be studied.

3. To enable reliable analyses to be made, the productivity needs to be determined of Townsville lucerne based pastures at the property level.

4. A definition is necessary of the relative contribution to animal nutrition of leaf, stem and seed of Townsville lucerne.

5. The degree of destruction of the perennial grass sward desirable for Townsville lucerne introduction commensurate with soil stability.

6. The interaction between stocking rate, pasture management and superphosphate application in maintaining a desirable grass-Townsville lucerne balance in the pasture.

7. The reliable productivity of Townsville lucerne in sub-coastal areas reeciving between 22 and 30 inches average rainfall, and on poorer class soils.

8. The priority of characteristics on which selection of Townsville lucerne strains should be based — leaf, stem, seed or whole plant yield.

9. The amount of soil water available and the magnitude of moisture stress that Townsville lucerne can be expected to encounter particularly in the surface soil in different areas on various soils.

10. Most of the experimental work has been conducted with steers and their finishing, and investigations centred on Townsville lucerne productivity during and immediately after the wet season. The exact role of Townsville lucerne based fertilized pastures in the reproductive physiology of breeders is not clearly defined nor adequately demonstrated but it goes without saying that cows on an adequate plane of nutrition can be expected to conceive more readily and to rear their calves satisfactorily.

11. Determining the role of phosphate, protein, sodium and sulphur supplements in grazing cattle particularly with regard to reproduction.

12. The relative merits are not clear of (i) developing small areas of Townsville lucerne intensively through cultivation and heavy applications of superphosphate, or (ii) the application of Townsville lucerne and light dressings of superphosphate over a much wider area with a view to obtaining maximum dry matter (D.M.) return per unit of fertilizer applied, even should such forage be of inferior quality.

13. An insurance policy in the form of cash or fodder reserves appears to be highly desirable to cover the risk incurred in high stocking rates when drought occurs on Townsville lucerne based pastures. Conversely, drought risk may be considerably reduced on such pastures because of earlier and more rapid turnoff of cattle and generally improved animal health and condition, and insurance is less likely to be required. Clarification is needed.

14. When the areas under improved pasture is limited, which class of cattle should have access to such pasture? The economic effect of this on the whole property situation needs to be examined. In some particular situations there may be a distinct advantage in giving the 1st unit of Townsville lucerne to fattening and in other situations, it may be marginal which way the pasture is used. Alternative methods of feeding 1st calve cows are more likely to be available than alternative methods of fattening. Methods of maximising the advantages derived from Townsville lucerne pastures for the nutrition of cattle should have high priority and should be integrated into animal-pasture forage sequences commencing with breeders, through weaners, fats and starting again with breeders.

15. From a cost/benefit analysis of an experiment at Swan's Lagoon, Ayr one cwt of superphosphate per acre applied as an annual dressing on an established Townsville lucerne stand increased both Townsville lucerne and annual grasses and resulted in a 17 per cent marginal return on capital invested. Such a return is highly dependent upon the price paid for store cattle, and more case histories and analyses are required before generalisations can be made.

16. A number of other questions remain unresolved. These include the necessity for inoculating Townsville lucerne seed and the kind of pelleting material to be used and its effect on Rhizobium? Environmental factors and their relationship with Townsville lucerne germination, growth, productivity, seed production and keeping qualities expressed through digestibility of D.M. and level of phosphorus and nitrogen? The timing of grass introduction into areas developed to Townsville lucerne? How the continual removal of hay effects the fertility status of the soil and the Townsville lucerne population? The persistence of Townsville lucerne when grazed only during the dry season both where an associated grass is used and where Townsville lucerne only is grown? The effect of sub-average or out-of-season rainfall on associated grass species? The homoclimes for Townsville

lucerne and the potential range and value of new introductions of both Townsville lucerne and other *Stylosanthes* sp. need closer definition. The role of potassium, zinc, sulphur, copper and molybdenum in the nutrition of Townsville lucerne requires examination. The translocation of phosphorus in Townsville lucerne from senescent tissues to growing points and how efficiently this is done? The root development of Townsville lucerne and how this effects establishment, dry matter yield and seed setting is poorly understood particularly in the case of solodic soils with a surface horizon of variable depth. For a better understanding of community dynamics in relation to habitat and biotic influences, Townsville lucerne and associated grasses need to be studied in specific production situations with different fertilizer inputs, herbage consumption rates and nutrient recycling.