

## PERFORMANCE OF MERINO EWES GRAZING MITCHELL GRASS PASTURES WHEN SUPPLEMENTED WITH NITROGEN, PHOSPHORUS AND VITAMINS A.D.E.

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### *Summary*

Nitrogen supplementation of Merino ewes grazing Mitchell grass (*Astrebla* spp) pastures had no effect on reproductive performance nor a consistent effect on liveweight, but it increased clean wool production during October-December, and clean fleece weights.

Phosphorus supplementation depressed liveweight and clean wool production during October-December, and reduced reproductive performance.

Vitamins A, D and E supplemented at mating had no effect on liveweight, wool production nor reproductive performance.

The seasonal pattern of wool growth in this environment appeared to be largely a reflection of the response of pastures to rain.

### I. INTRODUCTION

Within the semi-arid pastoral zone of north-west Queensland, sheep productivity is low and variable. Average lamb marking percentages are only 41 per cent (Murray 1969), and average clean fleece weights are less than 2.3 kg/head, which is approximately half that obtained from sheep in the temperate semi-arid areas of Australia (Brown and Williams 1970). Since the area receives a predominantly summer rainfall, nitrogen (N) and phosphorus (P) concentrations in the Mitchell grass (*Astrebla* spp) pastures decline to low levels during late winter until the onset of effective rains (Weston and Moir 1969).

Ewes in this region are usually mated following 5-8 months grazing dry forage. Although hepatic reserves of vitamin A may not be limiting (Gartner and Johnston 1969), it is not known whether or not supplementation of vitamins at joining will affect reproductive performance.

This paper describes the effect of supplementation with N and/or P and vitamins A, D and E on the productivity of ewes. The effects of these treatments on blood and faecal composition have been given by Gartner and Murphy (1972).

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## II. MATERIALS AND METHODS

### (a) *Environment*

The experiment was done at the Toorak Sheep Field Research Station, 56 km south of Julia Creek, Queensland, at a latitude of 21 °S. This area of Mitchell grass downs country and its plant components have been described by Weston and Moir (1969). The experimental area received a very low rainfall (9 cm) during the growing season, and partial drought conditions prevailed throughout the experiment.

### (b) *Sheep*

Three hundred and twenty Merino ewes comprising equal numbers of maiden (1½ yr) and mature (34 yr) ewes were shorn in June 1969 immediately before the commencement of the experiment, and were allocated within each age group to four treatments by stratified randomisation on liveweight. Animals which died during the experiment were replaced by ewes of the same age and of approximately the same liveweight.

### (c) *Treatments and management*

The treatments were :—

- (i) The control group.
- (ii) N supplemented group. Urea was fed in a liquid mixture of molasses and water in troughs equipped with wooden flotation rafts to restrict intake. The estimated intake of nitrogen from urea (g/head/day) was 1.61 from July 10-October 2, 1969; 4.05 from October 3-December 22, 1969; 0.83 from January 2-April 9, 1970 and 2.11 from April 10-June 27, 1970.
- (iii) P supplemented group. P as  $\text{NaH}_2\text{PO}_4$  was premixed in the tank supplying the water trough. As P intake depended on water intake, the former ranged from 2.5 — 5.0g P/head/day for most of the experiment.
- (iv) N plus P supplemented group as for ii and iii.

Half of the sheep exhibiting oestrus during mating were treated intramuscularly with 10 ml of a multivitamin preparation\* containing 500,000 I.U. vitamin A, 250,000 I.U. vitamin D and 200 I.U. vitamin E.

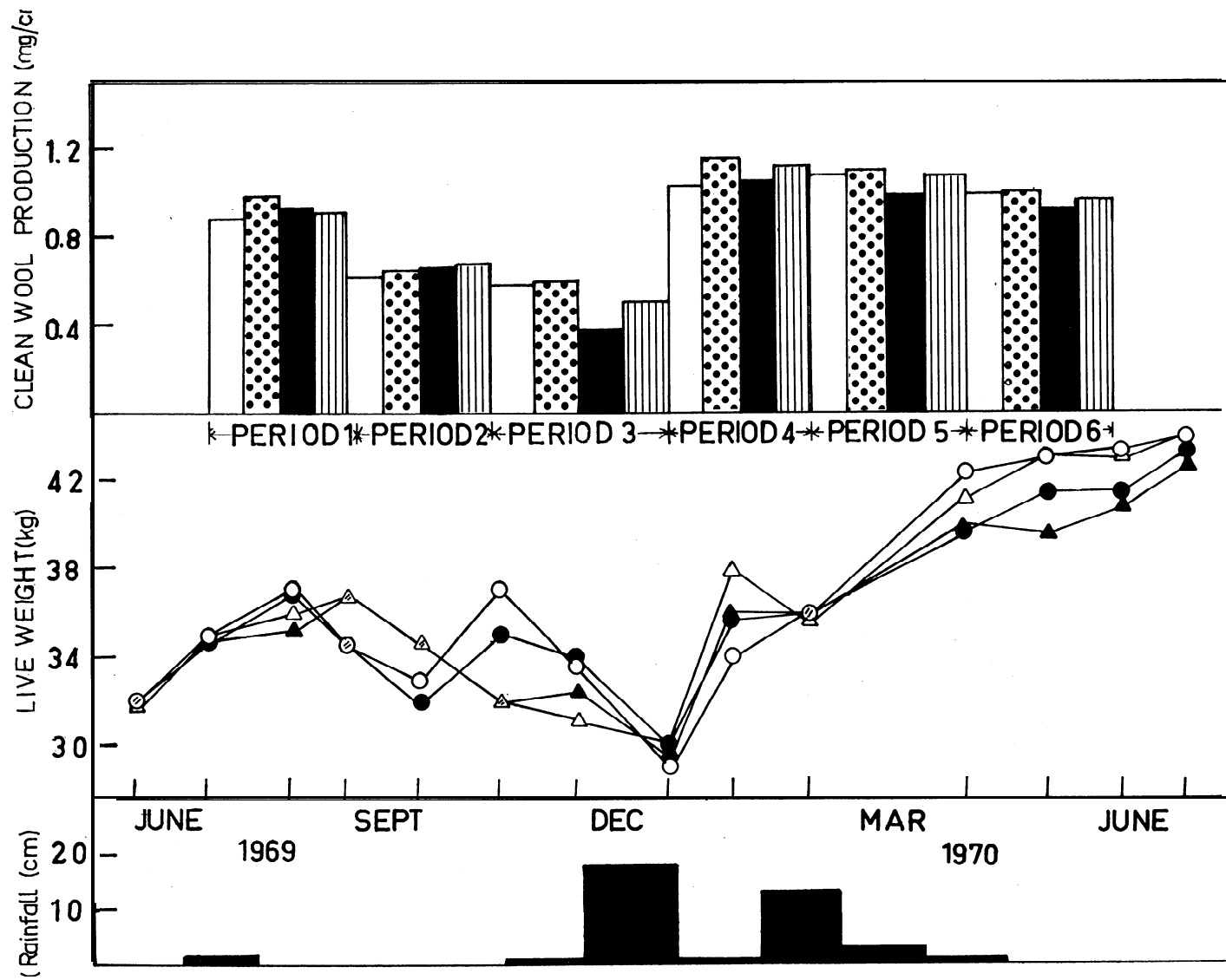
Each treatment group was allocated at random to a 130 ha paddock in July 1969. In an attempt to minimise the possible between-paddock variability, the treatments and sheep were rotated in a random sequence through the paddocks at 4-weekly intervals.

Sheep were weighed at 4-weekly intervals except during March when ewes were lambing. At 8-weekly intervals, dyebands were applied to a midside staple of 10 animals per group not receiving vitamins, and wool patches were later clipped for determinations of clean wool production, fibre diameter and linear rate of growth (Chapman and Wheeler 1963). Sheep were shorn in June 1970, greasy fleece weights recorded, and a midside sample taken for estimation of clean scoured fleece weight.

Ewes were mated for a 6 week period in October-November 1969 and two Merino rams were used per group. Six weeks before mating the rams were treated with 500,000 I.U. vitamin A, and during mating were rotated through the

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\*Rovisol — Roche Products (Australia)



groups in a random sequence at weekly intervals. Rams were equipped with harnesses and crayons (Radford, Watson, and Wood 1960) and oestrus was recorded weekly. Harnesses vasectomised rams were run with the ewes for 3 weeks after mating to detect returns to service. Pregnancy was diagnosed at 100 — 120 days after mating using an ultrasonic foetal blood flow detector\*.

### III. RESULTS

During the period October-December when pasture quantity and quality were limiting, there was no response in liveweight to N supplementation at intakes of 9 g urea/head/day. However, during the period April-June, when adequate pasture was available, N supplemented groups gained significantly less weight than did non-supplemented groups.

Only during October-December did N supplementation significantly increase both clean wool production ( $P < 0.05$ ) (Figure 1) and linear rate of wool growth ( $P < 0.01$ ), but over the experimental period, N supplementation resulted in a small but significant increase in total clean fleece weights, supplemented ewes having a mean fleece weight of 2.13 kg in contrast to 2.03 kg for unsupplemented ewes ( $P < 0.01$ ). During October-December, P supplementation resulted in a depression in clean wool production ( $P < 0.01$ ), fibre diameter ( $P < 0.01$ ) and linear rate of growth ( $P < 0.01$ ), although overall supply of P had no significant effect on clean fleece weights. Pregnancy significantly reduced both greasy and clean fleece weights, whilst lactation *per se* had no additional effect.

TABLE 1

***Reproductive performance of Merino ewes grazing Mitchell grass pastures when supplemented with nitrogen and phosphorus***

Treatment group:	Control		N as urea		P as $\text{NaH}_2\text{PO}_4$		N plus P		Total	
Age of ewe (yr)	1½	3½	1½	3½	1½	3½	1½	3½	1½	3½
No. of ewes	38	39	37	37	35	35	30	31	140	142
No. ewes exhibited oestrus	10	36	10	31	1	29	2	24	23	120
No. ewes pregnant										
100-120 days post-mating	6	31	9	30	1	24	1	15	17	100

A summary of the reproductive performance (Table 1) was derived only from ewes from which all observations were obtained. Regardless of treatment, age of ewe had a significant effect ( $P < 0.01$ ) on the percentage showing oestrus and pregnant at 100-120 days. Only 16 per cent of maiden ewes exhibited oestrus, and 12 per cent of the maiden ewes present at joining were pregnant. N supplementation had no obvious effect on reproductive performance. However, both oestrus and pregnancy were markedly depressed in ewes receiving P ( $P < 0.01$ ).

\*Sonicaid — Allard International Pty. Ltd., Bucks, U.K.

Analyses of all the productivity data indicated that administration of vitamins had no significant effect on the parameters examined.

#### IV. DISCUSSION

During recent years urea-molasses supplements have been widely used for sheep in north-west Queensland in an attempt to minimise the losses of production towards the latter part of the year. Although increases in both feed intake and utilization of dry roughages have been reported in pen-fed sheep supplemented with urea (Coombe 1959; Hemsley 1964, 1966), reports of field supplementation with urea have indicated that this practice is not always successful (Peirce, Moule, and Jackson 1955; N. P. McMeniman personal communication). Although urea supplementation failed to arrest liveweight decline in this experiment, a significant wool growth response was achieved which has not been reported previously (Loosli and McDonald 1968). This response occurred at a time when the nutritive value of the pasture was lowest, and had a longer term effect in increasing clean fleece weight over the entire period.

Apart from a preliminary report (Anon, 1963) there are no published observations on seasonal variations in wool growth from this environment. Data from the control group (Figure 1) indicate a distinctive seasonal pattern of wool growth which is largely a reflection of time of rainfall, and the response of pastures to rain, and which is similar to that recorded from north-west Western Australia (Williams and Suijddorp 1968). Further, even when maximum wool growths are realised, these are considerably lower than those reported from temperate semi-arid Australia (Reis and Williams 1965).

Lactation stress is unlikely to have contributed to the slower liveweight gains in N supplemented groups noted during April-June, since numbers of lactating ewes in the two groups were approximately equal. Observations of grazing behaviour of the supplemented groups indicated that substitution feeding was responsible for these differences, since long periods of time spent in the vicinity of the troughs tended to reduce time spent grazing.

Despite indications that P may be limiting at least in certain seasons (Gartner, Granzien, and Murray 1968), there was no productive response to P supplementation. In fact the decline in liveweights over the period September-December, and the depression of wool growth is considered to be a reflection in part of a sub-acute P toxicity in late August and again in October. Kennedy (1939) in studies in the same environment also found no evidence that production was improved by supplying a phosphatic lick.

The poor reproductive performance of maiden ewes was similar to that recorded previously for this class of animal in this environment (Anon. 1963; Murray 1970), and depending on the age structure of the, ewe flock, this factor can be a major contributing cause of the low reproductive rates which occur in this region.

Although ewes had been on dry feed for 6 months prior to mating, vitamin A status did not appear to be a limiting factor to reproductive performance.

## V. ACKNOWLEDGMENTS

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## VI. REFERENCES

- Anon. (1963). *Report of the Department of Agriculture, Queensland*. 1962-63.
- Brown, G. D., and Williams, O. B. (1970). *Journal of the Australian Institute of Agricultural Science*. **36**: 182.
- Chapman, R. E., and Wheeler, J. L. (1963). *Australian Journal of Science*. **26**: 53.
- Coombe, J. B. (1959). *Journal of the Australian Institute of Agricultural Science*. **25**: 299.
- Gartner, R. J. W., Granzien, C. K., and Murray, R. M. (1968). *Proceedings of the Australian Society of Animal Production*. **7**: 413.
- Gartner, R. J. W., and Johnston, D. C. (1969). *Australian Journal of Experimental Agriculture and Animal Husbandry*. **9**: 473.
- Gartner, R. J. W., and Murphy, G. M. (1972). *Proceedings of the Australian Society of Animal Production*. **9**: 241.
- Hemsley, J. A. (1964). *Proceedings of the Australian Society of Animal Production*. **5**: 321.
- Hemsley, J. A. (1966). *Proceedings of the Australian Society of Animal Production*. **6**: 383.
- Kennedy, J. F. (1939). M.Sc. Thesis. Univ. Melb.
- Loosli, J. K., and McDonald, I. W. (1968). F.A.O. Agric. Studies No. 75.
- Murray, R. M. (1969). *Australian Veterinary Journal*. **45**: 63.
- Murray, R. M. (1970). M.V.Sc. Thesis. Univ. Qd.
- Peirce, A. W., Moule, G. R., and Jackson, M. N. S. (1955). *Queensland Journal of Agricultural Science*. **12**: 107.
- Radford, H. M., Watson, R. H., and Wood, G. F. (1960). *Australian Veterinary Journal*. **36**: 57.
- Reis, P. J., and Williams, O. B. (1965). *Australian Journal of Agricultural Research*. **16**: 1011.
- Weston, E. J., and Moir, K. W. (1969). *Queensland Journal of Agricultural Animal Science*. **26**: 639.
- Williams, O. B., and Suijendorp, H. (1968). *Australian Journal of Experimental Agriculture and Animal Husbandry*. **8**: 653.