# THE JOURNAL OF AGRICULTURAL SCIENCE

#### EDITED BY

- PROF. J. W. L. BEAMENT, SC.D., F.R.S., Department of Applied Biology, Cambridge
- G. D. H. BELL, C.B.E., PH.D., F.R.S. Plant Breeding Institute, Cambridge
- K. L. BLAXTER, PH.D., N.D.A. (HONS.), D.SC., F.R.S.E., F.R.S., Rowett Research Institute, Bucksburn, Aberdeen
- G. W. COOKE, Ph.D., F.R.I.C., F.R.S., Rothamsted Experimental Station, Harpenden
- PROF. SIR J. B. HUTCHINSON, C.M.G., SC.D., F.R.S., Emeritus Professor of Agriculture, Department of Applied Biology, Cambridge
- J. L. LINZELL, B.SC., PH.D., M.R.C.V.S., Agricultural Research Council, Institute of Animal Physiology, Babraham, Cambridge
- PROF. J. B. OWEN, B.SC., Ph.D., M.A., School of Agriculture, Aberdeen
- H. L. PENMAN, O.B.E., PH.D., F.R.S., Rothamsted Experimental Station, Harpenden
- W. J. RIDGMAN, M.A., Department of Applied Biology, Cambridge
- H. H. ROGERS, B.SC., DIP.AG.SCI., Plant Breeding Institute, Cambridge
- L. E. A. ROWSON, O.B.E., M.R.C.V.S., Agricultural Research Council, Unit of Reproductive Physiology and Biochemistry, Animal Research Station, Cambridge
- PROF. E. W. RUSSELL, C.M.G., PH.D., F.INST.P., Department of Soil Science, University of Reading
- F. YATES, C.B.E., SC.D., F.R.S., Rothamsted Experimental Station, Harpenden

### VOLUME LXXXI

CAMBRIDGE AT THE UNIVERSITY PRESS 1973

#### PUBLISHED BY

## THE SYNDICS OF THE CAMBRIDGE UNIVERSITY PRESS

Bentley House, 200 Euston Road, London, NW1 2DB American Branch: 32 East 57th Street, New York, N.Y.10022

© Cambridge University Press, 1973

Printed in Great Britain at the University Printing House, Cambridge

# **Contents**

PART 1 (AUGUST) 1973	PAGE
Nikolić, J. Anna and Jovanović, M. Preliminary study on the use of different methods for determining the proportion of bacterial nitrogen in the total nitrogen of rumen contents	1
Johnson, E. R. and Beattle, A. W. Variation in muscle fibre diameter among sections and intrasections and between contralateral muscles in seven bovine muscles	9
Enyl, B. A. C. Growth rates of three cassava varieties (Manihot esculenta Crantz) under varying population densities.	15
Halliday, R. Serum immunoglobulin concentrations at two days of age in lambs born after ova transfer between ewes of different breeds	29
Foster, C. A. Prospects for the development of $F_1$ hybrid varieties of perennial ryegrass ( <i>Lolium perenne</i> ) and other herbage grasses	33
Salmon, R. C. Effects of initial phosphate intensity and sorption or buffering capacity of soil on fertilizer requirements of different crops grown in pots or in the field	39
Rodger, J. B. A., Gill, W. D. and Shukla, G. K. Comparisons of anhydrous ammonia with solid ammonium nitrate for spring barley and winter wheat 1967–70	47
SINGH, MANOHAR, YADAVA, I. S. and RAO, A. R. Stomach development in buffalo calves as influenced by different feeds	55
Wiseman, A., Dawson, Christine O., Pirie, H. M., Breeze, R. G. and Selman, I. E. The incidence of precipitins to <i>Micropolyspora faeni</i> in cattle fed hay treated with an additive to suppress bacterial and mould growth	61
PAY, M. G. and DAVIS, T. E. Growth, food conversion and carcass characteristics in castrated and entire male pigs fed three different dietary protein levels	65
MISHRA, S. N. and Drolsom, P. N. Associations among certain morphological traits of diallel cross progenies in <i>Bromus inermis</i> Leyss	69
Hill, J. and Shimamoto, Y. Methods of analysing competition with special reference to herbage plants. I. Establishment	77
Hill, J. Methods of analysing competition with special reference to herbage plants. II. Effects of associate plants	91
CHARLES, A. H. A comparison of ryegrass populations from intensively managed permanent pastures and leys	99
HENDERSON, C. The effects of fatty acids on pure cultures of rumen bacteria	107
SIONIT, N., GHORASHY, S. R. and KHERADNAM, M. Effect of soil water potential on growth and yield of sunflower ( <i>Helianthus annuus</i> )	113
Wilson, R. F. and Wilkins, R. J. Formic acid as silage additive. I. Effects of formic acid on fermentation in laboratory silos	117
SAGE, G. C. M. The expression of heterosis for yield in restored $F_1$ hybrid wheats and its interactions with seed rate and seed size $\dots \dots \dots \dots \dots \dots \dots$ .	125
Enyi, B. A. C. Effect of plant population on growth and yield of soya bean (Glycine max)	131
Fishwick, G. and Hemingway, R. G. Urea phosphate and mono-ammonium phosphate as dietary supplements for sheep fed diets inadequate in phosphorus and nitrogen	139

iv Contents

	PAGE
Ashworth, J. On measuring nitrification and recovery of aqueous ammonia applied to grassland	145
Heap, R. B., Gwyn, Merle, Laing, J. A. and Walters, D. E. Pregnancy diagnosis in cows; changes in milk progesterone concentration during the oestrous cycle and pregnancy measured by a rapid radioimmunoassay	151
SIKDER, H. P. Dormancy of paddy seeds in relation to different moisture contents of grains and dates of harvests	159
CALDER, F. W. and MACLEOD, L. B. Fertility studies in relation to soil type	165
DAVIS, R. H., HASSAN, O. E. M. and SYKES, A. H. Energy utilization in the laying hen in relation to ambient temperature	173
Jackson, G. and Williams, H. Ll. The effect of imposed light rhythms on semen production of Suffolk rams	179
SHORT NOTE GUNN, R. G. and Doney, J. M. A note on the influence of the pattern of live-weight and body condition recovery between weaning and mating on food consumption and reproductive performance of Scottish Blackface ewes	189
Part 2 (October 1973)	
Langlands, J. P. and Bennett, I. L. Stocking intensity and pastoral production. I. Changes in the soil and vegetation of a sown pasture grazed by sheep at different stocking rates. (With 2 text-figures)	193
LANGLANDS, J. P. and Bennett, I. L. Stocking intensity and pastoral production. II. Herbage intake of Merino sheep grazed at different stocking rates. (With 1 text-figure) .	205
Langlands, J. P. and Bennett, I. L. Stocking intensity and pastoral production. III. Wool production, fleece characteristics, and the utilization of nutrients for maintenance and wool growth by Merino sheep grazed at different stocking rates	211
CHADHOKAR, P. A. and HUMPHREYS, L. R. Effect of tiller age and time of nitrogen stress on seed production of <i>Paspalum plicatulum</i> . (With 3 text-figures)	219
ABOU AKKADA, A. R., HASSAN, M. A. and NAGA, M. A. Effect of some pesticides and herbicides on the rumen micro-organisms of sheep. (With 5 text-figures)	231
ELSAYED OSMAN, H. and AMIN, B. A. Further studies on the prediction of the nutritive value of protein for ruminants	237
PERRY, D. A. Studies on field establishment of monogerm sugar beet	245
SEEBECK, R. M. Sources of variation in the fertility of a herd of zebu, British, and zebu × British cattle in Northern Australia	253
WHITTINGTON, W. J., STANNARD, B. R., BOWRING, J. D. C. and JOHNSON, A. G. Hypocotyl length in the brussels sprout as a varietal characteristic. (With 1 text-figure)	263
DRAYCOTT, A. P., Webb, D. J. and Wright, E. M. The effect of time of sowing and harvesting on growth, yield and nitrogen fertilizer requirement of sugar beet. I. Yield and nitrogen uptake at harvest. (With 5 text-figures).	267
Scott, R. K., Ogunremi, E. A., Ivins, J. D. and Mendham, N. J. The effect of sowing date and season on growth and yield of oilseed rape ( <i>Brassica napus</i> ). (With 6 text-figures)	277
Scott, R. K., Ogunremi, E. A., Ivins, J. D. and Mendham, N. J. The effect of fertilizers and harvest date on growth and yield of oilseed rape sown in autumn and spring. (With	
6 text-figures)	287

Contents

	PAGE
Burlacu, G., Băia, G., Ionilă, Dumitra., Moisa, Doina., Tașcenco, V., Vișan, I. and Stoica, I. Efficiency of the utilization of the energy of food in piglets, after weaning. (With 4 text-figures)	295
STONE, D. A. Effects of fine-particle amendments on the soil moisture characteristics of a	200
gravelly sandy loam and on crop yields. (With 2 text-figures)	303
Bolle-Jones, E. W. and Sanei, F. Factors affecting yield and fertilizer response of sugar beet in Iran	311
Микноту, H. and Berg, R. T. Influence of breed and sex on muscle weight distribution of cattle. (With 1 text-figure)	317
NAIR, P. K. R. and Talibudeen, O. Dynamics of L and $NO_3$ concentrations in the root zone of winter wheat at Broadbalk using specific-ion electrodes. (With 6 text-figures)	327
Scott, R. K., English, S. D., Wood, D. W. and Unsworth, M. H. The yield of sugar beet in relation to weather and length of growing season. (With 9 text-figures)	339
SINGH, U. B., VARMA, A., VERMA, D. N., LAL, M. and RANJHAN, S. K. In vivo measurements of the production rates of bacteria in the rumen. (With 2 text-figures)	349
HAIGH, P. M. and EDEN, A. Studies on particle size distribution in pig dietary constituents	353
SHORT NOTES	
MORAG, THE LATE M. The definition of milk yield and milk fractions in lactating animals.	361
Ash, R. W. and Heap, R. B. The induction and synchronization of parturition in sows treated with I.C.I. 79,939, an analogue of prostaglandin $F_{2\alpha}$ . (With 1 text-figure)	365
Part 3 (December 1973)	
MISHRA, B. and TRIPATHI, B. R. Effect of N, P and K fertilizers on the availability of native and applied manganese to wheat	369
ONWUEME, I. C. The sprouting process in yam (Diosceroa spp.) tuber pieces	375
SCHMIDT, H., JÖCHLE, W. and SMIDT, D. Oestrous cycle synchronization and oestrus induction in indigenous and European cattle in Tanzania	381
Harrison, D. G., Beever, D. E., Thomson, D. J. and Osbourn, D. F. The influence of diet upon the quantity and types of amino acids entering and leaving the small intestine of sheep.	391
Moseley, G. and Axford, R. F. E. The effect of stress on the redistribution of calcium in sheep	403
Adams, S. N. The response of pastures in Northern Ireland to N, P and K fertilizers and to animal slurries. I. Effects on dry-matter yield.	411
Adams, S. N. The response of pastures in Northern Ireland to N, P and K fertilizers and to animal slurries. II. Effects of mineral composition	419
Bennett, J. W. Regional body surface area of sheep.	429
SYKES, A. R., NISBET, the late D. I. and FIELD, A. C. Effects of dietary deficiencies of energy and protein calcium on the pregnant ewe. V. Chemical analyses and histological examination of some individual bones	433
FISHWICK, G. and Hemingway, R. G. Magnesium phosphates as dietary supplements for growing sheep	441
YASSIN, T. E. Genotypic and phenotypic variances and correlations in field beans (Vicia faba L.).	445

vi Contents

	PAGE
Enyi, B. A. C. An analysis of the effect of weed competition on growth and yield attributes in sorghum (Sorghum vulgare), cowpeas (Vigna unguiculata) and green gram (Vigna	
aureus)	449
Bunting, E.S. Plant density and yield of grain maize in England	455
Widdowson, F. V., Penny, A. and Flint, R. C. Results from experiments comparing aqueous and anhydrous ammonia with 'nitro-chalk' for grass cut for silage	465
BURHAN, H. O. and JACKSON, J. E. Effects of sowing date, nitrogenous fertilizer and insect pest control on cotton yield and its year-to-year variation in the Sudan Gezira	<b>4</b> 81
Jackson, J. E., Burhan, H. O. and Hassan, H. M. Effects of season, sowing date, nitrogenous fertilizer and insecticide spraying on the incidence of insect pests on cotton in the	
Sudan Gezira	491
McIntosh, S., Crooks, P. and Simpson, K. Sources of magnesium for grassland	507
WORKER, JR. G. F., AYERS, R. S., KARAH, M. A. and THOMASON, R. E. Effect of dense, stratified sandy soil on crop roots	513
Czerkawski, J. W. Effect of linseed oil fatty acids and linseed oil on rumen fermentation in sheep.	517
Moir, K. W. The relationship between in vitro digestible cell wall and cell-wall content of forage	533
WILLEY, R. W. and BASIIME, D. R. Studies on the physiological determinants of grain yield in five varieties of sorghum	537
SHORT NOTES	
Habeshaw, D. A reassessment of the part played by rapid intracellular ice formation in producing frost damage in the field	549
Bolton, J. Sources of magnesium for sugar beet, potatoes and wheat grown on an acid sandy soil at Woburn, Beds	553
FREE, J. B. and WILLIAMS, INGRID H. The pollination of hybrid kale (Brassica oleraceae L.)	557

# Continued from back page

	PAGE
WORKER, JR. G. F., AYERS, R. S., KARAH, M. A. and THOMASON, R. E. Effect of dense, strati-	510
fied sandy soil on crop roots	513
CZERKAWSKI, J. W. Effect of linseed oil fatty acids and linseed oil on rumen fermentation in	
sheep	517
Moir, K. W. The relationship between in vitro digestible cell wall and the cell-wall content of	
forage	533
WILLEY, R. W. and BASIME, D. R. Studies on the physiological determinants of grain yield in	
five varieties of sorghum	537
SHORT NOTES	
HABESHAW, D. A reassessment of the part played by rapid intracellular ice formation in	
producing frost damage in the field	549
BOLTON, J. Sources of magnesium for sugar beet, potatoes and wheat grown on an acid sandy	
soil at Woburn, Beds	553
FREE, J. B. and WILLIAMS, INGRID H. The pollination of hybrid kale (Brassica oleraceae L.)	557

## THE JOURNAL OF AGRICULTURAL SCIENCE

## CONTENTS

## Vol. 81 Part 3 December 1973

	PAGE
MISHRA, B. and TRIPATHI, B. R. Effect of N, P and K fertilizers on the availability of native and applied manganese to wheat	369
ONWUEME, I. C. The sprouting process in yam (Dioscorea spp.) tuber pieces	375
SCHMIDT, H., JÖCHLE, W. and SMIDT, D. Oestrous cycle synchronization and oestrus induction in indigenous and European cattle in Tanzania.	381
HARRISON, D. G., BEEVER, D. E., THOMSON, D. J. and OSBOURN, D. F. The influence of diet upon the quantity and types of amino acids entering and leaving the small intestine of sheep	391
Moseley, G. and Axford, R. F. E. The effect of stress on the redistribution of calcium in sheep	403
Adams, S. N. The response of pastures in Northern Ireland to N, P and K fertilizers and to animal slurries. I. Effects on dry-matter yield	411
ADAMS, S. N. The response of pastures in Northern Ireland to N, P and K fertilizers and to animal slurries. II. Effects of mineral composition	419
BENNETT, J. W. Regional body surface area of sheep	429
SYKES, A. R., NISBET, the late D. I. and FIELD, A. C. Effects of dietary deficiencies of energy, protein and calcium on the pregnant ewe. V. Chemical analyses and histological examination of some individual bones	433
FISHWICK, G. and HEMINGWAY, R. G. Magnesium phosphates as dietary supplements for growing sheep	441
YASSIN, T. E. Genotypic and phenotypic variances and correlations in field beans (Vicia faba L.)	445
Enyi, B. A. C. An analysis of the effect of weed competition on growth and yield attributes in sorghum (Sorghum vulgare), cowpeas (Vigna unguiculata) and green gram (Vigna	
aureus)	449
BUNTING, E. S. Plant density and yield of grain maize in England	455
WIDDOWSON, F. V., PENNY, A. and FLINT, R. C. Results from experiments comparing aqueous and anhydrous ammonia with 'nitro-chalk' for grass cut for silage	465
BURHAN, H. O. and JACKSON, J. E. Effects of sowing date, nitrogenous fertilizer and insect pest control on cotton yield and its year-to-year variation in the Sudan Gezira	481
JACKSON, J. E., BURHAN, H. O. and HASSAN, H. M. Effects of season, sowing date, nitrogenous fertilizer and insecticide spraying on the incidence of insect pests on cotton in the Sudan Gezira	491
McIntosh, S., Crooks, P. and Simpson, K. Sources of magnesium for grassland	507

Continued on inside back cover

## © Cambridge University Press, 1973

SUBSCRIPTIONS. Two volumes of three parts are published annually. The 1973 subscription price is £9.00 net (U.S.A. and Canada US \$30.00) per volume (post free); single parts are available at £4.00 net (U.S.A. and Canada US \$12.00) plus postage. Orders or enquiries may be sent to any bookseller or subscription agent, or to Cambridge University Press, P.O. Box 92, London NW1 2DB. (U.S.A. and Canada, Cambridge University Press, American Branch, 32 East 57th Street, New York, N.Y. 10022, U.S.A.)