

FURTHER READING

GENERAL COTTON NUTRITION

Rochester IJ, Peoples MB (1998). 'Optimising cotton nutrition'. 9th Australian Cotton Conference. (Broadbeach, 1998) pp139-144.

Hearn AB (1981). Cotton nutrition. *Field Crop Abstracts* 34, 11-34.

Hodges SC (1992). Nutrient Deficiency Disorders. In R.J. Hillocks (ed.) *Cotton Diseases*. CAB International.

Holden J (1994). Macquarie valley grower survey. *Australian Cotton Grower* 15(3) 51-52.

Rochester I, Constable G, Peoples M (2000). Monitoring cotton nutrition. 10th Australian Cotton Conference. (Brisbane, 2000) pp 283-287.

CROP NUTRITION MANUALS

Glendinning J (1999). *Australian Soil Fertility Manual*. Fertilizer Industry Federation of Australia Inc. CSIRO Publishing.

Reuter D, Robinson J (1997). *Plant analysis – An interpretation manual* (2nd edition). CSIRO Publishing.

Peveerill K, Sparrow L, Reuter D (1999). *A Soil Analysis Interpretation Manual*. CSIRO Publishing.

NITROGEN

Constable GA, Rochester, IJ (1988). N application to cotton on clay soil: timing and soil testing. *Agronomy Journal* 80, 498-502.

Rochester IJ, Constable GA, MacLeod DA (1991). Mineral N dynamics in a fallow grey clay. *Australian Journal of Experimental Agriculture* 31, 237-44.

Constable GA, Rochester IJ, Betts JH, Herridge DF (1991). Prediction of N fertilizer requirement in cotton using petiole and sap nitrate. *Communications in Soil Science and Plant Analysis* 22, 1315-1324.

Constable GA, Rochester, IJ, Daniells IG (1992). Cotton yield and N requirement is modified by crop rotation and tillage method. *Soil and Tillage Research* 23, 41-59.

Freney JR, Chen DL, Mosier AR, Rochester IJ, Constable GA, Chalk PM (1993). Use of nitrification inhibitors to increase fertilizer N recovery and lint yield in irrigated cotton. *Fertilizer Research* 34, 37-44.

Rochester IJ, Gaynor H, Constable GA, Saffigna PG (1994). Etridiazole may conserve fertilizer N and increase lint yield of irrigated cotton. *Australian Journal of Soil Research* 32, 1287-1300.

Rochester IJ, Constable GA, Saffigna PG (1996). Effective nitrification inhibitors may improve fertilizer recovery in irrigated cotton. *Biology and Fertility of Soils* 23, 1-6.

Humphreys E, Freney JR, Constable GA, Smith JWB, Lilley D, Rochester IJ (1990). The fate of your N fertilizer. *Australian Cotton Conference*, Broadbeach, pp 161-164.

PHOSPHORUS

Dorahy C, Rochester IJ, Blair GJ (1998). Determination of the critical soil and plant phosphorus levels for cotton. 9th Australian Cotton Conference. (Broadbeach) pp 165-169.

Dorahy C, Rochester IJ, Blair GJ (2000). Improving phosphorus fertilizer decisions for cotton. 10th Australian Cotton Conference. (Brisbane) pp 277-281.

POTASSIUM / PREMATURE SENESCENCE

Premature senescence – Grower information. Cotton Seed Distributors Ltd.

Wright P (1999). Premature senescence of cotton – predominantly a potassium disorder caused by an imbalance of source and sink. *Plant and Soil* 211: 231-239.

Bedrossian S, Singh B, Wright P (2000). Premature senescence in cotton in relation to potassium availability in soil: preliminary results. 10th Australian Cotton Conference. (Brisbane) pp 293-296.

SOILS

SOILpak for cotton growers.

MACHINERY

Machine-pak : a machinery manual for the Cotton Industry in Australia

MICRONUTRIENTS

Constable GA, Rochester IJ, Cook JB (1988). Zinc, copper, iron, manganese and boron uptake by cotton on cracking clay soils of high pH. *Australian Journal of Experimental Agriculture* **28**, 351-356.

Constable GA, Rochester IJ, Cook JB (1986). A survey of soil and plant levels of trace elements in NSW cotton areas. *3rd Australian Cotton Conference*, Surfers Paradise. pp 31-35.

IRRIGATION AND WATERLOGGING

Constable GA, Rochester IJ, Hodgson AS (1990). A comparison of drip and furrow irrigated cotton on a cracking clay soil 1. Growth and N uptake. *Irrigation Science* **11**, 137-142.

Rochester IJ, Constable GA (2000). Denitrification in flood-irrigated alkaline clays as affected by nitrification inhibitors, crop stubble and soil texture. *Australian Journal of Soil Research* **36**, 655-667.

ROTATION CROPS

Rochester IJ, Peoples MB, Constable GA, Gault RR (1998). Faba beans and other legumes add nitrogen to irrigated cotton cropping systems. *Australian Journal of Experimental Agriculture* **38**, 253-260.

Marshall J et al (1996). The benefits of rotation cropping to cotton. 8th Australian Cotton Conference proceedings (pp 463-7).

COTTON STUBBLE MANAGEMENT

Rochester IJ, Constable GA, Saffigna PG (1997). Retention of cotton stubble enhances N fertilizer recovery and lint yield of irrigated cotton. *Soil and Tillage Research* **41**, 75-86.

Conteh A, Blair G, Rochester I, Lefroy R, Macleod D (1999). The effects of cotton stubble management systems and cotton rotation sequences on soil organic carbon fractions. In proceedings of the CRC Research Review, Narrabri, July 1999 pp. 45-52.

Conteh A, Blair GJ, Rochester IJ (1998). Soil organic carbon fractions in a Vertisol under irrigated cotton production as affected by burning and incorporating cotton stubble. *Australian Journal of Soil Research* **36**, 655-667.

Rochester IJ, Constable GA, MacLeod DA (1993). Cycling of fertilizer and cotton crop residue N. *Australian Journal of Soil Research* **31**, 597-609.

GLOSSARY OF NUTRITION TERMS

Name	Symbol / acronym	Primary nutrient	Notes
Alternaria		K	A leaf spot disease that can be associated premature senescence
Ammonia	NH ₃	N	Anhydrous ammonia - 82%N
Ammonium	NH ₄ ⁺	N	Mineral form of N
Boron	B	B	
Calcium	Ca	Ca	
Chelate		Many	Organic carrier for fertilizers
Chlorosis		Many	Lightening in the colour of leaf tissue
Copper	Cu	Cu	
Cut out		N	Growth stage of a crop where square and flower production cease
Denitrification		N	Process of nitrogen loss during waterlogging
Di-ammonium phosphate	DAP	P,N	18%N, 22%P – better on acid soils
Diffusion		All	Process of nutrient movement through water
Dolomite	CaMgCO ₃	Ca,Mg	Calcium magnesium carbonate
DTPA extraction	DTPA	Many	Chemical extractant for soil micronutrients
EDTA extraction	EDTA	Many	Chemical extractant for soil micronutrients
Gypsum	CaSO ₄	Ca	Calcium sulfate
Immobilisation		Many	Conversion of mineral nutrients to organic form
Iron	Fe	Fe	Fe ²⁺ is the physiologically active form in plants
Labile			Form of a nutrient that moves between available and non-available pools
Leaching		Many	Movement of nutrients within soil profile & water
Lime	CaCO ₃	Ca	Calcium carbonate
Magnesium	Mg	Mg	
Manganese	Mn	Mn	
Mass flow		All	Movement of nutrients in flow of water
Milligrams per kilogram	mg/kg	All	equivalent to parts per million
Mineral		All	Inorganic form
Mineralisation		All	Conversion of organic to inorganic form
Molybdenum	Mn	Mn	
Mono ammonium phosphate	MAP		9%N, 22%P. Used in alkaline soils (not DAP)
Necrotic		Many	Dying tissue
Nitrate	NO ₃ ⁻	N	Form of mineral N available to plants
Nitrogen, atmospheric	N ₂	N	Comprises 78% of air
Nitrous oxide	N ₂ O	N	Greenhouse gas - product of denitrification
NutriLOGIC		N	A component of the CottonLOGIC software package that estimates N fertilizer requirements from soil or petiole nitrate analyses
Organic		All	Derived from living organisms
Organic matter	OM		Derived from living organisms
Parts per million	ppm	All	equivalent to milligrams per kilogram
Petiole			The stalk connecting the leaf blade and the stem
Phosphorus	P	P	
Pith			Light tissue at the centre of stems and petioles
Potassium	K	K	
Premature senescence		K,P	A potassium-related syndrome connected with high boll loads and weather, cultivar and soil fertility
Sulfur	S	S	
Turgor		K	Rigidity of plant cells brought about by pressure of internal fluids
Urea		N	N fertilizer - 46% N
Urea Ammonium Nitrate	UAN	N	N fertilizer - ~30% N. Used for foliar application
Volatilisation		N	Evaporation of a gas from a solid into the air
Youngest Mature Leaf	YML	Many	Normally the 5 th open leaf from the terminal.
Zinc	Zn	Zn	

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