

## References

- Abbott, A.J. 1967. Physiological effects of micronutrient deficiencies in isolated roots of *Lycopersicon esculentum*. *New Phytologist* 66, 419-437.
- Ae, N., Arihara, J., OkadaYoshihara, T. K. and Johansen, C. Phosphorus uptake by pigeon pea and its role in crop.
- Ascher-Ellis J. S., Graham R. D., Hollamby G. J., Paull J., Davies P., Huang C., Pallotta M. A., Howes N., Khabez- Saberi H., Jefferies S. P. and Moussavi-Nik M. 2001. Micronutrients. In Application of Physiology in Wheat Breeding. Eds. M P Reynolds, J I Ortiz-Monasterio and A McNab. CIMMYT, Mexico.
- Bansal R. L, Nayyar V. K, Takkar P. N. 1991. Field screening of wheat cultivars for manganese efficiency. *Field Crop Res.* 29, 107-112.
- Bansal, R. L. and Nayyar V. K. 1998. Screening of wheat (*Triticum aestivum*) varieties tolerant to manganese deficiency stress. *Indian Journal of Agricultural Sciences.* 68, 66-69.
- Bell, P. F. and Kovar, J. L. 2000, Rice. In C.R. Campbell (ed.), *Reference Sufficiency Ranges for plant Analysis in the Souther Region of the United States [online]*. South. Coop. Serv. Bull. 394, July. Available at <http://www.Agr.state.nc.us/agronomic/saaesd/s394/htm>.

- Brown, P. H., Graham, R. D. and Nicholas, D. J. D. 1984. The effects of manganese and nitrate supply on the level of phenolics and lignin in young wheat plants. *Plant Soil*. 81, 437-440.
- Burnell, J. N. 1988. The biochemistry of manganese in plants. In 'Manganese in Soils and Plants' (R.D. Graham, R.J. Hannam and N.C. Uren, eds.), pp. 125-137. Kluwer Academic, Dordrecht.
- Campbell, L. C. and Nable, R. O. 1988. Physiological functions of manganese in plants. In 'Manganese in Soils and Plants' (R.D. Graham, R. J. Hannan and N.C. Uren, eds.). pp. 139-154. Kluwer Academic, Dordrecht.
- Carpita, N., Sabulase, D., Montezinos, D. and Delmer, D. P. 1979. Determination of the pore size of cell walls of living plant cells. *Science* 205, 1144-1147.
- Cassab, G. I. and Varner, J. E. 1988. Cell wall proteins. *Annu. Rev. Plant Physiol. Plant Mol. Biol.* 39, 321-353.
- Cataldol, D. A., McFadden, K. M., Garland, T. R. and Wildung, R. E. 1988. Organic constituents and complexation of nickel (II), iron (III), cadmium (II), and plutonium (IV) in soybean xylem exudates. *Plant Physiol.* 86, 734-739.
- Chang, T.-T. 1976. The origin, evolution, cultivation, dissemination, and diversification of Asian and African rices. *Euphytica* 25, 425-441.

- Constantopoulos, G. 1970. Lipid metabolism of manganese-deficient algae. I. Effect of manganese deficiency on the greening and the lipid composition of *Euglena gracilis* Z. *Plant Physiol.* 45, 76-80.
- Darrah P R 1993 The rhizosphere and plant nutrition: a quantitative approach. *In* Plant Nutrition - From Genetic Engineering to Field Practice. Ed. N J Barrow. pp. 3–22. Kluwer Academic, Dordrecht.
- Delhaize, E., Dell, B., Kirk, G., Loneragan, J., Nable, R., Plaskett, D. and Webb, M. 1984. Manual of Research Procedures. First edition. Plant nutrition research group school of environmental and life science. Murdoch University, Australia.
- Dinkelaker, B., Hahn, G., Romheld, V., Wolf, G. A. and Marschner, H., 1993a. “Non-destructive methods for demonstrating chemical changes in the rhizosphere I. Description of methods” *Plant and Soil* 155/156: 71-74. © 1993 Kluwer Academic Publishers. Printed in the Netherlands.
- Dinkelaker, B., Hahn, G. and Marschner, H., 1993b. “Non-destructive methods for demonstrating chemical changes in the rhizosphere II. Application of methods” *Plant and Soil* 155/156: 75-78. © 1993 Kluwer Academic Publishers. Printed in the Netherlands.
- Dion, H. G. and Mann, P. J. G. 1946. Trivalent manganese in soil. *J. Agric. Sci.* 36, 239-245.

- Dobermann, A. and Fairhurst, T. 2000. Manganese deficiency. Rice. Nutrient disorders & nutrient management. Handbook series. Potash & Phosphate Institute (PPI), Potash & Phosphate Institute of Canada (PPIC) and International Rice Research Institute. 191 p.
- Eschrich, W. 1976. 'Strasburger's Kleines Botanisches Praktikum für Anfänger.' Fischer, Stuttgart.
- Gardner, W. K., Boundy, K. A. 1983. The acquisition of phosphorus by *Lupinus albus* L. IV. The effect of interplanting wheat and white lupin on the growth and mineral composition of the two species, *Plant Soil*. 70
- Gerloff, G. C. 1977. Plant efficiencies in the use of N, P and K. *In Plant Adaptation to Mineral Stress in Problem Soil*. Ed. M J Wright. pp 161-174. Cornell University Press, New York.
- Gherardi M J and Rengel Z. 2003. Genotypes of lucerne (*Medicago sativa* L.) show differential tolerance to manganese deficiency and toxicity when grown in bauxite residue sand. *Plant Soil* 249, 287–296.
- Gherardi, M. J. and Rengel, Z. 2004. The effect of manganese supply on exudation of carboxylates by roots of lucerne (*Medicago sativa*). *Plant and Soil*. 260, 271-282.

- Gladstones, J. S., Loneragan, J. F. 1970. Nutrient elements in herbage plants, in relation to soil adaptation and animal nutrition. *Proceedings of XI International Grassland Congress*, Brisbane. pp. 350–354.
- Graham R. D., Davies, W. J., Asher, J. S. 1985. The critical concentration of manganese in field-grown wheat. *Aust. J. Agr. Res.* 36, 145–155.
- Graham, R. D. 1984. Breeding for nutritional characteristics in cereals. In 'Advances in Plant Nutrition' (P.B. Tinker and A. Lauchli, eds), Vol.1, pp. 57-102. Praeger, New York.
- Graham, R. D. 1988. Genotypic differences in tolerance to manganese deficiency. In 'Manganese in Soils and Plants' (R.D. Graham, R. J. Hannan and N.C. Uren, eds.), pp. 261-276. Kluwer Academic, Dordrecht, The Netherlands.
- Graham, R. D., Ascher, J. S. and Hynes, S. C. 1992. Selecting zinc-efficient cereal genotypes for soils of low zinc status. *Plant Soil* 146, 241–250.
- Graham, R. D., Davies, W. J., Sparrow, D.H.B., Asher, J. S. 1983. Tolerance of barley and other cereals to manganese-deficient calcareous soils of South Australia. In: Saric MR, Loughman BC, eds. *Genetic Aspects of Plant Nutrition*. Martinus Nijhoff, Netherlands. pp. 339–345.
- Graven, E. H., Attoe, O. J. and Smith, D. 1965. Effect of liming and flooding on manganese toxicity in alfalfa. *Soil Sci. Soc. Am. Proc.* 29, 702-706.

- Hannam, R. J. and Ohki, K. 1988. Detection of manganese deficiency and toxicity in plants. In 'Manganese in Soils and Plants' (R.D. Graham, R. J. Hannan and N.C. Uren, eds.), pp. 243-259. Kluwer Academic, Dordrecht.
- Hebborn, C. A., Peadas, P., Schjoerring, J. K., Knudsen, L. and Husted, S. 2005. Genotypic differences in manganese efficiency: field experiments with winter barley (*Hordeum vulgare* L.). *Plant and soil*, 272, 233-244.
- Hefler, S. K. and Averill, B.A. 1987. The 'manganese (III)-containing' purple acid phosphatase from sweet potatoes is an iron enzyme. *Biochem. Biophys. Res. Commun.* 146, 1173-1177.
- Hope, A. B. and Stevens, P. G. 1952. Electrical potential rences in bean roots on their relation to salt uptake. *Aust. J. Sci., Ser. B5*, 335-343.
- Horst, W. J. and Waschies, C. 1987. Phosphorus nutrition of spring wheat (*Triticum aestivum* L.) in mixed culture with white lupin (*Lupinus albus* L.), Z. Pflanzenernaehr, Bodenkd. 150.
- Huang, C. and Graham, R.D. 1997. Efficient Mn uptake in barley is a constitutive system. In: T. Ando et al., (eds.) *Plant nutrition-for sustainable food production and environment*, Kluwer Acad. Publ., Japan, pp. 269-270.
- Huang, C., Webb, M. J. and Graham, R. D. 1994. Manganese efficiency is expressed in barley growing in soil system but not in solution culture. *J. Plant Nutr.* 17, 83-95.

- Hughes, N. P. and Williams, R. J. P. 1988. An introduction to manganese biological chemistry. *In* 'Manganese in Soils and Plants' (R.D. Graham, R. J. Hannan and N.C. Uren, eds.), pp. 261-276. Kluwer Academic, Dordrecht.
- Inal, A., Geunes, A., Zhang, F., Cakmak, I. 2007. Peanut / maize intercropping induced changes in rhizosphere and nutrient concentrations in shoots. *Plant Physiology and Biochemistry*. xx, 1-7.
- Insalud, N. 2006. Genotypic variation in responses to aerobic and anaerobic conditions in rice. Ph.D. Thesis, Graduate School. Chiang Mai University, Chiang Mai, 228 p.
- Jeschke, W. D. and Pate, J. S. 1991. Modelling of the partitioning, assimilation and storage of nitrate within root and shoot organs of castor bean (*Ricinus communis* L.). *J. EXP. Bot.* 42, 1091-1103.
- Jiang, W. Z. 2008. Comparison of responses to Mn deficiency between the UK wheat genotypes Maris Butler, Paragon and the Australian wheat genotype C8MM. *Journal of Integrative Plant Biology*. 50 (4), 457-465.
- Jiang, W. Z., Ireland, C. R. 2001. Mn efficiency in old wheat plants. In: ICAST Organizing Committee, ed. *International Conference on Agriculture Science and Technology, session 5: Post Harvest Management*, November 7-9, 2001, Beijing. pp. 122-155.

- Jiang, W. Z., Ireland, C. R. 2005. Characterization of manganese use efficiency in UK wheat cultivars grown in a solution culture system and in the field. *Journal of Agricultural Science*. 143, 151–160. ©2005 Cambridge University Press.
- Kaur NP, Takkar PN, Nayyar VK. 1989. Some physiological studies on differential susceptibility of wheat and triticale to manganese deficiency. *Ann. Biol. Ludhiana* 5, 115–122.
- Khabaz-Saberi, H.; Robin, D.; Graham, R. D. and Rathjen, A. J. 1997. Genotypic variation for Mn efficiency in durum wheat (*Triticum turgidum* L. var. *durum*). In: *Plant Nutrition- for sustainable food production and environment*, T. Ando et. al. (Eds), Kluwer Academic Publishers, Tokyo. 289-290.
- Krahmer, R. and Sattelmacher, B. 2001. Determination of Mn and Cu efficiency of crop plants in pot experiments. *In: Plant nutrition - Food security and sustainability of agro-ecosystems*. Eds. W. J. Horst et al. Kluwer Academic Publishers. Printed in the Netherlands, pp. 118-119.
- Kreidemann, P. E., Graham, R.D. and Wiskich, J. T. (1985. Photosynthetic dysfunction and in vivo changes in chlorophyll a fluorescence from manganese-deficient wheat leaves. *Australian Journal of Agricultural Research*. 36, 157–169.
- Kuo, J., Pate, J. S., Rainbird, R. M. and Atkins, C. A. 1980. Internodes of grain legumes- New location of xylem parenchyma transfer cells. *Protoplasma* 104, 181-185.



- Lang, A. and Thorp, M. R. 1989. Xylem, phloem and transpiration flows in a grape: application of a technique for measuring the volume of attached fruits to high resolution using archimedes' principle. *J. Exp. Bot.* 40, 1069-1078.
- Leigh, R. A. and Wyn Jones, R. G. 1986. Cellular compartmentation in plant nutrition: the selective cytoplasm and the promiscuous vacuole. *In 'Advances in Plant Nutrition 2'* (B. Tinker and A. Lauchli, eds.), pp. 249-279. Praeger Scientific, New York.
- Lerer, M. and Bar-Akiva, A. 1976. Nitrogen constituents in manganese-deficient lemon leave. *Physiol. Plant.* 38, 13-18.
- Li, L., Tang, C. Z., Rengel, F. and Zhang, S. 2003. Chickpea facilitates phosphorus uptake by wheat from an organic phosphorus. *Plant Soil.* 248.
- Li, S. M., Li, L., Zhang, F.S. and Tang, C. 2004. Acid phosphatase role in chickpea/maize intercropping. *Ann. Bot.* 94.
- Lindon, F. C., Barreiro, M. G. and Ramalho, J. C. 2004. Manganese accumulation in rice: implications for photosynthetic functioning. *J. Plant Physiol.* 161: 1235-1244.
- Lindsay, W. L. 1972. Inorganic phase equilibria of micronutrients in soil. *In Micronutrients in Agriculture*, Soil Sci. Soc. America, Inc., Madison/USA. p. 41-57.
- Linehan D J, Sinclair A H and Mitchell M C 1985 Mobilisation of Cu, Mn and Zn in the soil solutions of barley rhizospheres. *Plant Soil* 147-149.
- Longnecker, N. E., Graham, R. D. and Card, G. 1991. Effects of manganese deficiency on the pattern of tillering and development of barley (*Hordeum vulgare* cv. Galleon). *Field Crops Res.* 28, 85-102.

- Ma, J. F., Kusano, G., Himura, S. and Nomoto, K. 1993. Specific recognition of mugineic acid-ferric complex by barley roots. *Phytochemistry*. 34: 599-603.
- Marcar N E and Graham R D 1987a Tolerance of wheat, barley, triticale and rye to manganese deficiency during seedling growth. *Aust. J. Agric. Res.* 38, 501–511.
- Marcar NE, Graham RD. 1987b. Genotypic variation for manganese efficiency in wheat. *J. Plant Nutr.* 10, 2049–2055.
- Marchner, H. 1995. *Mineral Nutrition of Higher Plants*, 2<sup>nd</sup> ed. Academic Press, New York
- Marschner, H. 1988. Mechanisms of manganese acquisition by roots from soils In R.D. Graham et al., (eds) *Manganese in Soils and Plants*, Kluwer Acad. Publ. Dordrecht, pp. 191-205.
- Marschner P, Fu QL, Rengel Z. 2003. Manganese availability and microbial populations in the rhizosphere of wheat genotypes differing in tolerance to Mn deficiency. *Journal of Plant Nutrition and Soil Science* 166, 712–718.
- Marschner, H., Treeby, H. M., and Römheld, V. 1989. Role of root induced changes in the rhizosphere for iron acquisition in higher plants. *Z. Pflanzenernahr Bodenk.* 152a, 197-204.
- Matin, P. 1982. Stem xylem as a possible pathway for mineral retranslocation from senescing leaves to the ear in wheat. *Aust. J. Plant Physiol.* 9, 197-207.
- McCarthy, K. W., Longnecker, N. E., Sparrow, D. H. B. and Graham, R. D. 1988. Inheritance of manganese efficiency in barley (*Hordeum vulgare* L.). In Webb, M.

- J., Nable R., Gramham, R. D. and Hannam, R. J. (eds.) Int. Symposium  
Manganese in soils and Plants, Contributed papers. Adelaide.
- McDonald, G. K., Graham, R. D., Lloyd, J., Lewis, J., Lonergan, P. and Khabas-Saberi,  
H. 2001. Breeding for improved zinc and manganese efficiency in wheat and  
barley. In 10th Australian Agronomy Conference, Hobart, Australia, 2001.
- McNeil, D. L. 1980. The role of the stem in phloem loading of minerals in *lupinus albus*  
L. cv. Ultra *Ann. Bot.* (London) [N.s.] 45, 329-338.
- Meesin, S. 2003. The structure of genetic diversity in a local Thai rice germplasm. MSc  
Thesis (Agronomy). Graduate School, Chiang Mai University, Chiang Mai,  
Thailand, 142 p.
- Morgan, P. W., Taylor, D. M. and Joham, H. E. 1976. Manipulation of IAA-oxidase activity  
and auxine-deficiency symptoms in intact cotton plants with manganese nutrition.  
*Plant Physiol.* 37, 149-156.
- Mukhopadhyay, MJ., Sharma, A. 1991. Manganese in cell metabolism of higher plants. *The  
Botanical Review* 57, 117-149.
- Nable, R. O., Bar-Akivar, A. and Lonergan, J. F. 1984. Functional manganese requirement  
and its use as a critical value for diagnosis of manganese deficiency in subterranean  
clover (*Trifolium subterraneum* L. cv. Seaton Park). *Ann. Bot.* 54, 39-49.
- Ness, P. J. and Woolhouse, H. W. 1980. RNA synthesis in *Phaseolus* chloroplasts. I.  
Ribonucleic acid synthesis and senescing leave. *J. Exp. Bot.* 31, 223-233.

- Neumann, G., Massonneau, A., Martinoia, E. and Römheld, V. 1999. Physiological adaptations to phosphorus deficiency during proteoid root development in white lupin. *Planta* 208, 373–382.
- Neumann, G., Römheld, V. 1999. Root excretion of carboxylic acids and protons in phosphorus-deficient plants. *Plant Soil*. 211.
- Nielsen, H.H. and Jensen, E. S. 2005. Facilitative root interactions in intercrops, *Plant Soil*. 274.
- Nayyar VK, Bansal RL, Takkar PN, Tandon JP. 1991. Wheat varieties differ in their tolerance to manganese deficiency. *Indian Farming* 40, 7–8.
- Ohki, K. 1985. Manganese deficiency and toxicity effects on photosynthesis, chlorophyll, and transpiration in wheat. *Crop Science*. 25, 187–191.
- Ohwaki, Y. and Hirata, H. 1990. In *Plant Nutrition – Physiology and Applications*. Ed. M L van Beusichem. pp 171-177. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Racette S, Louis I and Torrey J G 1990 *Can. J. Bot* 68, 2564-2570.
- Page, E.R. 1962. Studies in soil and plant manganese. II. The relationship of soil pH to manganese availability. *Plant and Soil*. 16, 247-257.
- Pedraza, P., Christopher A. Hebbern, Jan K. Schjoerring, Peter E. Holm, and Søren Husted *Plant Physiology*, November 2005, Vol. 139, pp. 1411–1420,  
[www.plantphysiol.org](http://www.plantphysiol.org) \_ 2005 American Society of Plant Biologists
- Pedraza, P., Hebbern, C. A., Schjoerring, J. K., Holm, P. E. and Husted, S. 2004. Differential capacity for high-affinity manganese uptake contributes to differences

between barley genotypes in tolerance to low manganese availability. *Plant Physiol.* 139, 1411-1420.

Pearson, J. N. and Rengel, Z. 1997. Genotypic differences in the production and partitioning of carbohydrates between root and shoot of wheat grown under zinc or manganese deficiency. *Annals of Botany.* 80, 803-808.

Phattarakul N., Jamjod S. and Rerkasem B. 2008. Genotypic variation in tolerance to Acid soil in local upland rice varieties. Ph.D. Thesis, Graduate School. Chiang Mai University, Chiang Mai, 185 p.

Pintasen, S., Prom-u-thai, C., Jamjod, S., Yimyam, N., Rerkasem, B. 2007. Variation of grain iron content in a local upland rice germplasm from the village of Huai Tee Cha in northern Thailand. *Euphytica* 158: 27-34.

Pirson, A. 1937. Ernährungs- und stoffwechselphysiologische Untersuchungen an *Frontalis* und *Chlorella*. *Z. Bot.* 31, 193-267.

Polle, A., Chakrabarti, K., Chakrabarti, S., Seifert, F., Schramel, P. and Rennenberg, H.

1992. Antioxidants and manganese deficiency in needles of Norway spruce (*Picea abies* L.) trees. *Plant Physiol.* 99, 1084-1089.

Prom-u-thai, C., Pintasen, S., Jamjod, S., Rerkasem, B. 2004. Variation in grain iron between seed lots of some upland rice varieties. In New directions for a diverse planet: Proceedings of the 4th International Crop Science Congress, Brisbane, Australia.

Randhawa, N. S., Sinha, H. K. and Takkar, P. N. 1978. Micronutrients, *In: Soils and Rice* (Research Institute, ed.) pp. 581-603. Los Banos, Philipines.

Rengel, Z. 1997. Root exudates and microflora populations in rhizosphere of crop genotypes differing in tolerance to micronutrient deficiency, In T. Ando et al., (eds) *Plant nutrition-for sustainable food production and environment*. Kluwer Acad. Publ. Japan, pp. 243-248.

Rengel, Z. 2000. Manganese uptake and transport in plants. *In Metal Ions in Biological Systems*. Eds. A Sigel and H Sigel. pp. 57-87. Marcel Dekker, New York.

Rengel, Z. 2001. Genotypic differences in micronutrient use efficiency in crops. *Commun. Soil Sci. Plan* 32, 1163-1186.

Rengel, Z. 2002. Genetic control of root exudation, *Plant Soil*. 245.

Rengel, Z., Pedler, J. F. and Graham, R. D. 1994. Control of Mn status in plants and rhizosphere: genetic aspects of host and pathogen effects in wheat take-all interaction. In: Manthey J. A., Crowley, D.E., Luster, D. G., eds. *Biochemistry of metal micronutrients in the rhizosphere*. Boca Raton: Lewis Publishers/CRC Press, 125-145.

Reuter, D. J., Alston, A. M. and McFarlane, J. D. 1988. Occurrence and correction of manganese deficiency in plants. *In 'Manganese in Soils and Plants'* (R.D.

Graham, R.J. Hannam and N.C. Uren, eds.), pp. 205-224. Kluwer Academic, Dordrecht.

- Reuter, D. J., Edwards, D. G. and Wilhelm, N. S. 1997. Temperate and Tropical Crops. *In Plant Analysis: An Interpretation Manual*. Eds. D. J. Reuter and J. B. Robinson. pp. 81–279. CSIRO Publishing, Victoria.
- Römheld, V. 1998. The soil-root interface (rhizosphere): Its relationship to nutrient availability and plant nutrition. In: *International workshop on role of environmental and biological factors in acquisition of toxic and essential elements by plants*. Research Institute of Pomology and Floriculture, Skierniewice. pp. 41-58.
- Römheld, V. and Marschner, H. 1990. Genotypical differences among graminaceous species in release of phytosiderophores and uptake of iron phytosiderophores. *Plant Soil*. 123, 147-153.
- Rutherford, R. B. 1989. Photosystem II, the water-splitting enzyme. *Trends Bio-chem. Sci.* 14, 227-232.
- Saberi, H. K., Graham, R.D. and Rathjen, A. J. 1999. Inheritance of manganese efficiency in durum wheat. *Journal of Plant Nutrition*. 22, 11–21.
- Sadana US, Lata K, Claassen N. 2002. Manganese efficiency of wheat cultivars as related to root growth and internal manganese requirement. *Journal of Plant Nutrition*. 25, 2677–2688.
- Saric, M. R. 1987. Progress since the first international symposium : 'Genetic aspects of plant mineral nutrition'. Beogard, 1982, and perspectives of future research. *Plant and Soil*. 99: 197-209.

- Sharma, C. P., Sharma, P. N., Chatterjee, C. and Agarwala, S. C. 1991. Manganese deficiency in maize effects pollen viability. *Plant Soil*. 138, 139-142.
- Shenker, M., Plessner, O. E., Tel-Or, E. 2004. Manganese nutrition effects on tomato growth, chlorophyll concentration, and superoxide dismutase activity. *Plant Physiol*. 161, 197-202.
- Simpson, D. J. and Robinson, S. R. 1984. Freeze-fracture ultrastructure of thylakoid membranes in chloroplasts from manganese-deficient plants. *Plant Physiol*. 74, 735-741.
- Smit, D., Paulsen, G. M. and Raguse, C. A. 1964. Extraction of total available carbohydrate from grass and legume tissues. *Plant Physiol*. 39, 960-962.
- Snyder, G. H. and Jones, D. B. 1988. Prediction and prevention of iron-related rice seedling chlorosis on Everglades Histosols. *J. Soil Sci. Soc. AM. J.* 52, 1043-1046.
- Snyder, G. H., Jones, D. B. and Coale, F. J. 1990. Occurrence and correction of manganese deficiency in Histosol-grown rice. *J. Soil Sci. Soc. Am.* 54, 1634-1638.
- Supamongkol, P. 2006. Genetic diversity of local rice cv. Muey Nawng. MSc Thesis (Agronomy). Graduate School, Chiang Mai University, Chiang Mai, Thailand, 94 p.
- Swaine, D. J. 1955. The trace element content of soil. *Soil Sci. Techn. Comm. No.* 48.

Herald Printing Works, Coney St., York (England).



- Takagi, S., Nomoto, K., and Takemoto, T. 1984. Physiological aspect of mugineic acid, a possible phytosiderophores of graminaceous plants. *J. Plant Nutr.*, 7, 469-477.
- Tanaka, A. and Yoshida, S. 1970. Nutritional disorders of the rice plant in Asia. Intern. Rice Res. Ins., Technical Bulletin 10.
- Treeby, M., Marschner, H., and Römheld, V. 1989. Mobilization of iron and other micronutrients from a calcareous soil by plant-borne microbial and synthetic metal chelators. *Plant and Soil*, 114, 217-226.
- Uehara, K., Fujimoto, S. and Taniguchi, T. 1974. Studies on violet-colored acid phosphatase of sweet potato. II. Enzymatic properties and amino acid composition. *J. Biochem. (Tokyo)* 75, 639-649.
- Uren, N. C. 1981. Chemical reduction of an insoluble higher oxide of manganese by plant root. *J. Plant Nutr.* 4, 65-71.
- Uren N C and Reisenauer H M 1988 The role of root exudates in nutrient acquisition. *In* Advances in Plant Nutrition. Vol. 3. Eds. B Tinker and A Läuchli. pp. 79–114. Praeger, New York.
- Van Bel, A. J. E. 1984. Quantification of the xylem-to-phloem transfer of amino acids by use of inulin ( $^{14}\text{C}$ ) carboxylic acid as xylem transport marker. *Plant Sci. Lett.* 35, 81-85.
- Wasaki, J., Yamamura, T., Shinano, T. and Osaki, M. 2003. Secreted acid phosphatase is expressed in cluster lupin in response to phosphorus deficiency. *Plant Soil.* 248.

Webb, M. J. 1994. Recent aspects of Mn and Zn absorption and translocation in cereals.

In Manthey, J. A. et al., (eds.) *Biochemistry of metal Micronutrients in the Rhizosphere*. Lewis Publishers, London, pp. 183-198.

Webb, M. J., Dell, B. 1990. Effect of manganese supply on development of wheat

(*Triticum aestivum*) roots. In: Van Beusichem ML, ed. *Plant nutrition-physiology and applications*. Proceedings of the Eleventh International Plant Nutrition Colloquium, Wageningen, 235-239.

Welch, R. M. 1995. Micronutrient nutrition of plants, Critical Reviews, *Plant Sciences*.

14(1), 49-82.

White, M. C., Decker, A. M. and Chaney, R. L. 1981a. Metal complexation in xylem

fluid. I. Chemical composition of tomato and soybean stem exudates. *Plant Physiol.* 67, 292-300.

White, M. C., Decker, A. M. and Chaney, R. L. 1981b. Metal complex in xylem fluid. II.

Theoretical equilibrium model and computational computer program. *Plant Physiol.* 67, 301-310.

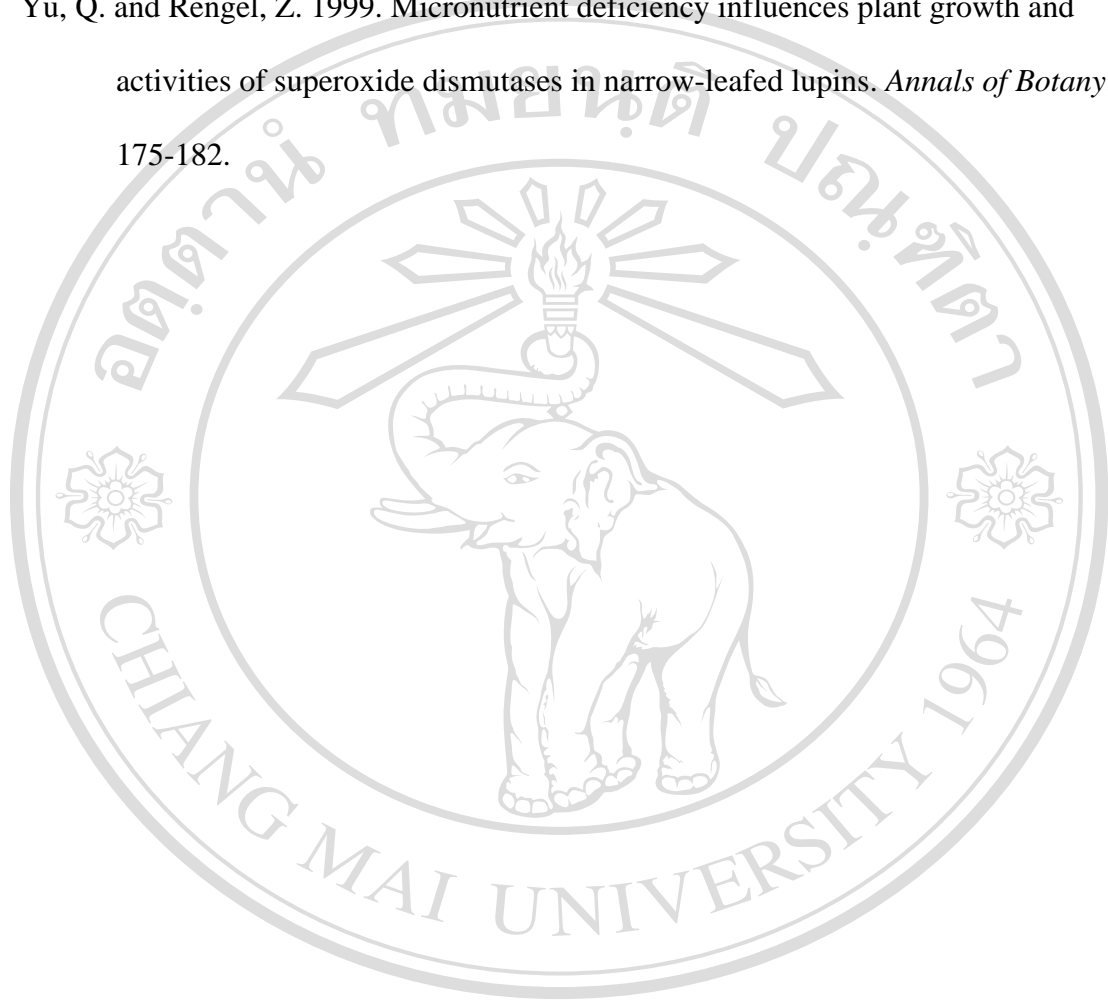
Wilkinson, R. D. and Ohki, K. 1988. Influence of manganese deficiency and toxicity on isoprenoid synthesis. *Plant Physiol.* 87, 841-846.

Wilson, D. O., Boswell, F. C., Ohki, K., Parker, M. B., Shuman, L. M. and Jellum, M. D.

1982. Changes in soybean seed oil and protein as influenced by manganese nutrition. *Crop Sci.* 22, 948-952.

- Wink, M. 1993. The plant vacuole: a multifunctional compartment. *J. Exp. Bot.* 44 Suppl., 231-246.
- Wirén, N., Mori, S., Marschner, H. and Römheld, V. 1994. Iron inefficiency in maize mutant *ys1* (*Zea mays* L. cv Yellow-stripe) is caused by defect in uptake of iron phytosiderophores. *Plant Physiol.* 106:72-77.
- Wood, L. J., Murray, B. J., Okatan, Y., and Nooden, L.D. 1986. Effect of petiole phloem distribution on starch and mineral distribution in senescing soybean leaves. *Am. J. Bot.* 73: 1377-1383.
- Yamasaki, T. 1964. The role of microelement. In 'The Mineral Nutrition of The Rice Plant'. Proceedings of a Symposium at The International Rice Research Institute, 107-122.
- Yanaphan R. and Rerkasem B. 2005. Iron efficiency in Thai rice genotypes. In: Proceedings of the 15<sup>th</sup> International Plant Nutrition Colloquium. Beijing, China. (in press).
- Yoshida, S. 1975. Factors that limit the growth and yields of upland rice. Major research in upland rice. IRRI-International Rice Research Institute. P.O. Box 933, Manila, Philippines.
- Yoshida, S., Forno, D., Cock, J., and Gomez, K. 1976. Laboratory manual for Physiological Studies of Rice, 3<sup>rd</sup> eds. The International Rice Research Institute. Los Banos, Philippines. pp. 14-16.

Yu, Q. and Rengel, Z. 1999. Micronutrient deficiency influences plant growth and activities of superoxide dismutases in narrow-leaved lupins. *Annals of Botany*. 83, 175-182.



ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

Copyright© by Chiang Mai University

All rights reserved