
UNIVERSITI PUTRA MALAYSIA

# IMPROVEMENT OF PINEAPPLE PRODUCTION ON TROPICAL PEAT THROUGH FERTILIZER USE

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FP 1999 17

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By

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Thesis Submitted in Fulfilment of the Requirements for the Degree of Doctor of Philosophy in the Faculty of Agriculture Universiti Putra Malaysia

July 1999

**FOR MY PARENTS**

***&***

**TO THE MEMORY OF MY**
**GRAND PARENTS**

## ACKNOWLEDGEMENTS

Praises to Almighty Allah, the Cherisher and Sustainer of this wonderful world, whose blessings enabled the author to complete this project.

The author wishes to express his sincere gratitude to Dr. Mohamed Hanafi Musa, the Chairman of the Supervisory Committee for his active guidance, valuable advice and generous help during the research works and in the preparation of this dissertation.

The author is also grateful to Dr. Anuar Abdul Rahim and Dr. Ahmad Husni Mohd. Hanif (members of the supervisory committee) for their invaluable assistance and guidance at various stages of research works and in the preparation of this dissertation.

The author is grateful and thankful to the entire management of Peninsula (Pineapple) Plantations Sdn. Bhd., Simpang Rengam, Johor, especially to Mr. Lee Sing Kim, Mr. Koh Soo Koon and Mr. Faizul Abdul Ghani for their appreciation and kind co-operation during my stay and field research in the estate. The financial supports of the National Council for Scientific Research and Development Malaysia through the Intensification of Research in Priority Areas (IRPA) funding and the encouragement of UPM in research and development are gratefully acknowledged.

I am greatly indebted to the entire technical staff of the Department of Land Management, UPM, especially to Puan Fauziah Solaiman, Mr. Abdul Rahim Uttar

and Mr. Jamil Omar for their cooperation during my research works and for their friendly attitudes throughout my stay.

The author is indebted to the administrative authority of Bangladesh Institute of Nuclear Agriculture (BINA) for providing deputation and all sorts of help to accomplish his degree. The author is also thankful to all of his friends and colleagues whose names are impossible to list for their help and moral encouragement. Special thanks are due to Dr. M. Anisur Rahman and Bhabi, Dr. M. Syedul Islam and Bhabi, Dr. M.A. Saleque and Pinky Bhabi for providing the author with immense help and homely atmosphere to complete his difficult task.

Sincere appreciation goes to his parents, younger brother and sister, father in law, uncles and aunts for their love, sacrifices and spiritual support that made the author what he is. Last but not the least, the author is extremely grateful to his loving wife, Foara Hasan, lovely daughter and son, Sammanah Hasan and Salman Hasan for their patience, sacrifices and love which have been constant inspirations.

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Information on the agronomic characteristics and nutritional requirements of pineapple (cv. Gandul) is lacking in peat soil. Therefore, studies in the field at two sites (site 1 and site 2), glasshouse and laboratory were carried out to investigate the effects of N, P, K, Ca, Mg and Cu on growth, yield and quality of pineapple and to assess the loss of the applied nutrients through leaching. Six levels of each of N, P, K, Ca, Mg and Cu were studied separately at each site of the field in a RCB design with three replications. In the glasshouse, three levels of each of the above nutrients were studied with soils from both sites. Leaching studies using soil columns were conducted in the laboratory with two levels of each nutrient for a period of 30 days. Plant height and leaf number increased with age up to forcing time at both sites. D-leaf length and area were influenced with N application, while the leaf dry weight was influenced with Mg at site 2. The leaf nutrient concentrations were influenced by N, P, Ca and Mg at site 1 and by N, P and K applications at site 2. Leaf nutrient concentrations increased up to six months of plant age and declined at forcing at both

sites. The mean fruit weight of pineapple responded quadratically with N application at both sites and with Ca at site 1 and declined linearly with the increment of P at site 2. There was no significant effect of nutrients on fruit quality except for P on sugar content at site 1. Fruit yield was positively correlated with leaf N concentrations at both sites and negatively correlated with Cu at site 1. The highest nutrient recoveries (%) were 15 and 16 (N); 53 and 45 ($P_2O_5$); 13 and 28 ($K_2O$); 41 and 29 (CaO); 55 and 50 (MgO); and 0.81 and 3 (CuO) at site 1 and site 2, respectively. Leaf dry weight responded with the increment of N, K and Cu at site 1 and with N, P, Ca and Mg at site 2. Stem dry weight was influenced with the increment of N, P, Mg and Cu at site 1 and with N, P and Cu at site 2. Root dry weight decreased with the increment of P and Cu applications at site 1 and with Ca and Cu at site 2. There was an unbalanced accumulation of dry matter in the stem (<8%) at site 2. Nutrient concentrations in leaves and roots varied with the applied nutrients at both sites. The total loss of nutrients (70 - 80%) occurred within 3 - 4 days of leaching at site 1, while those percentages leached within 7 days at site 2. The total N content in soil increased with N application at site 2. The P content increased in the unfertilized soil at site 1. Exchangeable K and extractable Cu increased with K and Cu applications at both sites. Most of the applied P and Cu remained at the surface layer but N and Mg moved down the soil profile at site 1. At site 2, N, Mg and Cu contents remained at the surface layer but K content increased at the bottom layer of the column. The calculated optimum fertilizer rates (kg $ha^{-1}$) were N = 872 and 750; $P_2O_5$ = 24 and 48; $K_2O$ = 400 and 266; CaO = 108 and 84; MgO = 24 and 36 and CuO = 2 and 3 for site 1 and site 2, respectively.