

A PRELIMINARY STUDY ON THE ORGANIC ACIDS IN THE COCONUT PALM TISSUES

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acids remains practically unexplored in the case of the coconut palm. The perennial nature of this monocot with a productive phase of more than sixty years and the increasing number of nutritional, physiological and pathological problems in its cultivation makes this study all the more important. An investigation in this line has therefore been initiated and result of a preliminary qualitative survey of the non-volatile organic acids in the different parts of the palm is presented in this note.

MATERIALS AND METHODS

Pressed juice of root, stem, petiole and husk; alcoholic extracts of kernel and leaf in the different stages of development and coconut water from nuts in the ontogenic stages were chromatographed on Whatman No. 1, circular filter paper using amyl alcohol 5 M formic acid (1:1) as solvent and 0.04% alcoholic solution of bromophenol blue (PH adjusted to 6.7) as the spray reagent. The organic acids were confirmed by spotting authentic samples side by side the tissue fluids and by observation of the chromatogram under ultraviolet light after suitable treatments.

RESULTS AND DISCUSSION

The organic acids present in different tissues are illustrated in chromatogram in Fig. 1. Malic acid is found to be predominant in all the tissues examined. This might be of special significance in as much as this acid is attributed with several functions in the plant system namely checking transpiration (Kraus, 1906), fixation of carbon dioxide (Werkmann & Wood, 1942), Cation-anion balance (Jacobson & Ordin, 1954) and formation of starch by certain non-photosynthetic process (Buriss, 1953). Citric acid, which is another important Krebs cycle acid is identified in the extracts of root, stem, leaf and husk. In addition, faint bands in chromatograms in the position of succinic acid are noted in the extracts of kernel, leaf, stem and root. Considerable quantity of malic acid is present in coconut water and kernel in all stages of development which is found to decrease slightly with maturity. Malic, shikimic and quinic acids have already been reported in coconut water (Tulecke, *et al.* 1961). The role of various organic acids in fruits is a complex one, for they affect not only respiration but also protein

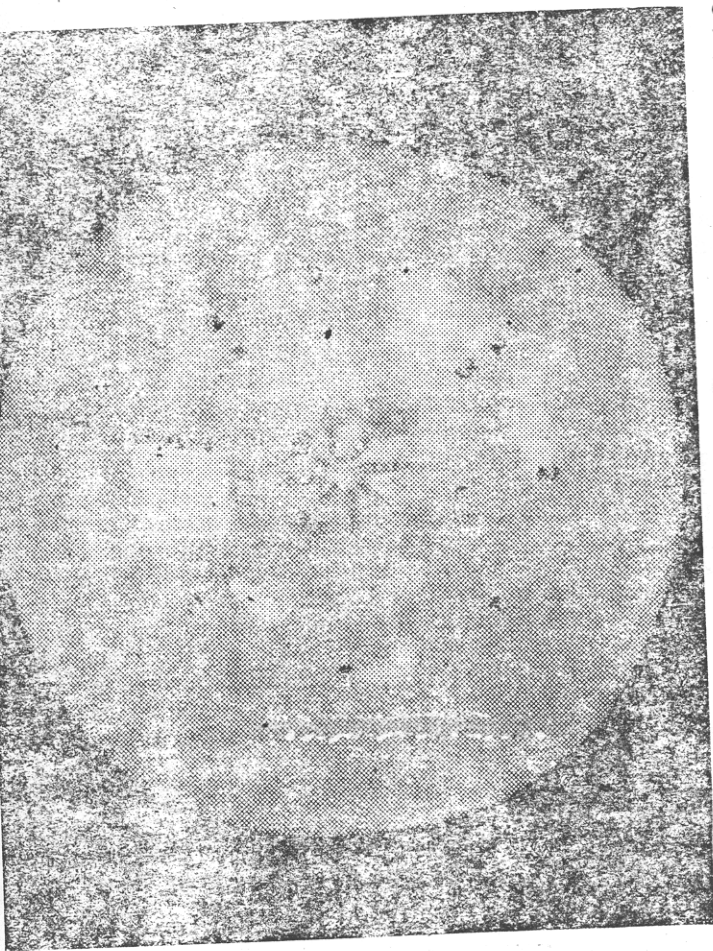


Figure 1. 1. Succinic acid 2. Malic acid
3. Citric acid 4. Sulphamic acid

The key position of organic acids in plant metabolism as intermediates in the tricarboxylic acid cycle which releases energy and interrelates fat, carbohydrate and protein metabolism has been well realised. Their dynamic roles as buffer systems and in cation-anion balance in the cells are also well known (Jacobson and Ordin, 1954). Thimann and Bonner (1950) and Buriss (1953) have covered thoroughly most of these aspects in their reviews on organic acid metabolism in plants. The field of metabolism of organic

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SUMMARY

A qualitative survey of the non-volatile organic acids in different parts of the palm as also in the ontogenic stages of the leaf, kernel and water has been conducted. Malic acid is found to be predominant in all the tissues examined. Oxalic, citric, malonic, malic and succinic acids were identified in the different tissues and the possible presence of sulphamic, ascorbic and fumaric acids is indicated. A quantitative study of these acids as also their variation in health and disease, in different varieties and under different environmental conditions are in progress.

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REFERENCES

- BURRIS, R.H., 1953 : Organic acids in plant metabolism; *Ann. Rev. Plant Physiol*; **4**, (6) 91-114.
- CANOY, C.S.; PAMINTUA N-ROBLES, R., GABERTAN DEL ROZARIO, A. and CANLAS, Z.M. 1969 : Some amino-acids and respiratory organic acids in coconut leaves. *Philippine Journal of Science*; **98** (1), 17-26.
- KRAUS, G.; 1906 : *Über den Nanismus unseverer Wellenkalkplätzen*. *Verh. Phys. Med. Ges. Würzburg*; N.F. XXXVIII.
- LOUIS JACOBSON and LAWRENCE ORDIN, 1954 : Organic acid metabolism and ion absorption in roots, *Plant Physiol*; **29** (70).
- NITSCH, J.P. 1953 : The Physiology of fruit growth. *Ann. Rev. Plant Physiol*; **4** (6). 199-227.
- SHIBANUMA, C; and others 1963 ; On changes in the sugars, Organic acids and pectic substances in grapes during ripening. *Teh. Bull. Fac. Hort, Chiba No. 11* : 77-80.
7. THIMANN, K. V. and BONNER, W.D. JR. 1950 : Organic acid metabolism. *Ann. Rev. Plant Physiol*; **1**, 75-108.
8. TULECKE, WALTER. LEONARD H; WEINSTEIN, ALAN RUTNER, and HENRY J. LAURENCOT Jr. 1961 ; The biochemical composition of coconut water (Coconut milk) as related to its use in plant tissue culture. *Contr. Boyce Thompson Inst*; **21**, (2), 115-118.
9. VASUDEVAN, V; and COIC, Y; 1960 : Organic acids in fig *Ann. Inst. Natl Rech. Agron. Ser. Abis*; *Ann Physiol. Veg.* **2** (3), 171-173.
10. WERKMANN, C.H., and WOOD, H.G., 1942 : Heterotrophic assimilation of carbon dioxide. *Advances in Enzymology*; **2**, 135-179.

