

RESPIRATORY RATE AND NUT YIELD IN ROOT (WILT) DISEASED COCONUT PALMS

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ABSTRACT

Respiratory changes and nut yield were studied in coconut palms infected by root (wilt) disease. Respiration rate was significantly higher in palms in the advanced stage of the disease as compared to that in healthy ones. A correlation of -0.54 was recorded between rate of respiration and nut yield.

INTRODUCTION

Respiration is an important indicator of the physiological state in biological systems. This process is disturbed during diseased condition. Diseased plants show rise in the respiratory rate (Sunderland and Merret, 1965; Cohen and Schiffman, 1972) resulting in some degenerative changes and deterioration of plant growth. The net photosynthesis *vis-a-vis* dry matter production and respiration are highly correlated. High rates of respiration decrease dry matter production and yield of crops (Glover, 1973; Hatch and Slack, 1970).

Root (wilt) disease of coconut, the aetiology of which is unknown, causes reduction in plant growth and nut yield. The purpose of the present investigation was to determine the rate of respiration and nut yield in healthy and diseased coconut palms.

MATERIALS AND METHODS

Twenty five young coconut palms, each in the categories of apparently healthy, diseased early, and diseased advanced, and another 25 healthy palms from a disease-

free area, were used in the study. The age of palms in both the categories ranged 15-25 years. Five leaflets each from either side of the middle region of the mid-rib of the first fully opened leaf of each palm were collected between 10.00 and 11.00 A.M. Fifteen leaf discs, each of 7 mm diameter, were punched out, weighed, and their respiratory rates were determined by Warburg's direct method. Citrate-phosphate buffer (pH 5.0 and 0.05 N) was used as the respiratory medium. After the experiment, the leaf discs were dried in an oven at 100°C for 24hr and the dry weight was determined. Rate of respiration was expressed as CO₂ consumed in mg/hr. The root systems of the same palms were also studied. Growing root tips collected from the above palms were brought to the laboratory, sliced to 1 mm thickness, and 0.4 g of such sliced root tips were used to determine the rate of respiration as was done in leaves. Yield of each palm was also determined.

RESULTS AND DISCUSSION

The respiratory rates varied between healthy and diseased palms and between leaf

and root tissues. The increase in respiration rates of the leaves of diseased palms ranged 18-21% in the advanced stages and 2-5% in the early stages of the disease. The roots of palms in advanced and early stages of the disease recorded 14.3% and 11.4% more respiration over apparently healthy palms. The respiration rates differed markedly between healthy and apparently healthy palms also. The higher rate of respiration in the leaves of diseased palms may be due to better availability or accumulation of total and reduced sugars (Mathew, 1977) and inorganic nutrients (Varkey and Michael, 1968).

Moisture content of leaf was higher in the palms growing in the diseased tract. The increase in respiration rates of leaves and roots of apparently healthy palms were 73% and 45% more than that of healthy palms (of healthy tract) on fresh weight basis and 97% and 106% more on dry weight basis. Owen (1956) reported 40% increase in respiration rate in tobacco leaves infected with tobacco mosaic virus. Cohen and Schiffman

(1972) observed a 10 times increase in respiration in lemon fruits infected with *Phytophthora citrophthora* and Sambroski and Shaw (1956) got three times increase in wheat infected with *Puccinia graminis*.

With increased rate of respiration, the nut yield was reduced in diseased early and diseased advanced palms (Fig. 1). A negative correlation of 0.54 was recorded between respiration rate and nut production. Yoshida (1972) and Robson (1973) have also observed decrease in dry matter with rise in respiration in plants.

From the results of the present investigation, it is proposed that rise in respiration rate may be one of the important causes for the drop in yield of nuts in root (wilt) disease affected palms.

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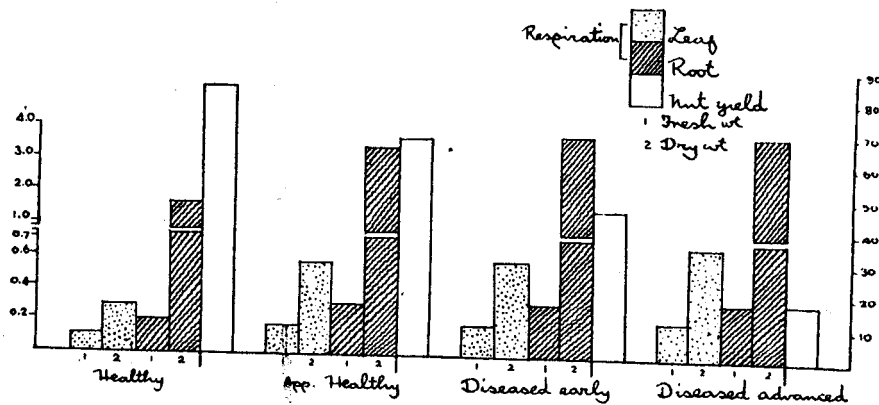


Fig. 1. Rate of respiration in healthy and root (wilt) disease affected coconut palms with reference to nut yield.

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