

The use of Ethrel-induced senescence of cacao fruits to study the control of cherelle wilt

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Summary

One of the problems in the study of cherelle wilt is to predict which fruits are going to wilt. To overcome this difficulty and aid in the study of cherelle wilt, it was found that the application of Ethrel to the pedicel of young fruit produced morphological changes similar to natural wilt. A preliminary experiment showed that induced wilt could be prevented by the application of indolebutyric acid and gibberellic acid.

Key words: *Theobroma cacao*, cherelle wilt, Ethrel, auxin, gibberellic acid.

Indução de senescência com Ethrel como método de estudo do controle do peco fisiológico dos frutos do cacauero

Resumo

Um dos problemas encontrados no estudo de peco no cacauero (*Theobroma cacao* L.) é antecipar quais frutos vão pecar. Aplicações de Ethrel ao pedicelo, realizadas no presente trabalho provocaram sintomas semelhantes ao peco fisiológico, o que sugere que o método pode ser utilizado experimentalmente em investigações desse fenômeno. Um ensaio preliminar mostrou que o peco assim induzido foi revertido pela aplicação de ácido indolbutírico e ácido giberélico.

Palavras-chave: *Theobroma cacao*, peco fisiológico, Ethrel, auxina, ácido giberélico.

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The fruits of cacao (*Theobroma cacao* L.) are susceptible to premature senescence, a physiological disorder known as cherelle wilt. This loss only occurs during the first 80 – 100 days after fruit set and the end of the susceptible period coincides with the completion of development of the vascular system within the fruit pericarp (Nichols, 1964).

Several hypothesis have been advanced in order to account for cherelle wilt. Nichols (1965) suggested that wilted fruits may have a lower auxin content, while Alvim (1954) speculated that carbohydrate supply might be a limiting factor for fruit development. Despite Nichols suggestion of auxin involvement in the wilt process, attempts to control the problem by the application of synthetic growth regulators have met with contradictory results. Naundorf and Villamil (1950) and Naundorf and Gardner (1950) were able to reduce the levels of cherelle wilt by the spray application of betanaphthoxyacetic acid, alpha-naphthaleneacetic acid, and p-chlorophenoxyacetic acid. In other studies, however, the application of these substances did not reduce the incidence of cherelle wilt (Murray, 1952, Mckelvie, 1954, 1957). Whatever the reason for these discrepancies, which may be due to ineffective penetration of the growth regulators (Vendrell, 1969), one of the difficulties in the study of cherelle wilt is to predict in advance which fruits are going to wilt. To overcome this problem it was found in the present work, that the application of Ethrel (2-chlorethyl phosphonic acid) to the pedicels of

young fruits produced physiological changes similar to natural wilt, i.e. cessation of growth, loss of chlorophyll, and desiccation.

Ethrel at a concentration of either 0.5%, 1.0%, 2.0%, and 10% (v/v/ in glycerine) was applied to the pedicel of fruits at all ages up to 100 days. It was found that 1.0% Ethrel induced 70 to 100% wilt of fruits up to 40 days old. Similarly, 2% and 10% Ethrel provoked wilt of fruits between the age of 40 – 80 days and 80 – 100 days respectively.

A preliminary experiment was conducted with the use of Ethrel-induced senescence of cacao fruits to study the control of cherelle wilt by growth regulators. Indolebutyric acid (IBA), furfuryl-amino-purine (kinetin), and gibberellic acid (GA_3) at a concentration of 1% in lanolin paste were applied in separate longitudinal strips on each of 10 fruits (80 days old) of the clone EEG 8. Six days later 10% Ethrel was applied to the pedicel of each fruit. Loss of chlorophyll was complete in the untreated areas of the fruit 7 days after Ethrel application, whereas the fruits had a green strip on the IBA-treated sector (Figure 1). Some chlorophyll was retained in the GA_3 -treated area, but the response was weaker than with IBA. Kinetin gave no response.

Ethylene production (Ethrel's action) is probably one of the last stages in the process of natural wilt, and it has been shown to decrease the movement of auxin (Morgan et al, 1972). The fact that Ethrel-induced senescence may be counteracted by the application of IBA



Figure 1 - An Ethrel-induced senescent cacao fruit pretreated with growth regulators, cut lengthwise to show three different treated sectors.

suggests that auxins may be involved in the natural wilt process, although this must obviously be the subject of further

study. The use of Ethrel, however, does indicate a useful approach to the study of the control of cherelle wilt of cacao.

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