Parte del arsénico incorporado por el agua de riego, especialmente en superficie, se insolubiliza. Dado el quimismo de este elemento, similar al del fósforo y las características del suelo (7; 13), posiblemente esa fracción precipita como arsénico ligado al calcio. Otra fracción, ligada evidentemente al sodio, permanece en solución y se mueve dentro del perfil.

El contenido de arsénico soluble en agua, en el área A, está en el umbral tóxico para los cultivos, ya que a despecho del arsénico total se citan efectos deletereos en diferentes especies vegetales con concentraciones de 1 a 9 ppm. (8; 10; 13) aunque hay que tener en cuenta que no todos los datos de arsénico soluble citados fueron obtenidos a partir de un extracto acuoso: En algunos casos se utilizaron soluciones de cloruro de amonio, acetato de amonio y otros extractantes (8; 13) y también que variaciones en la relación As/P en el suelo modifican la toxicidad del arsénico (3).

La carencia de vegetación en el área A no puede ser explicada exclusivamente por la alcalinidad del suelo y mucho menos por la salinidad, en este caso debe pensarse que existe, paralelamente, un efecto tóxico del arsénico soluble.

En conclusión, las aguas de riego pueden ser una fuente de contaminación de arsénico en suelos, en regiones con aguas ricas naturalmente con este elemento y también en regiones con aguas previamente contaminadas.

En esos casos será necesario evaluar arsénico paralelamente a otros parámetros determinados usualmente, y en ciertos casos prever medidas de corrección en el suelo.

Resumen

En un área irrigada con agua de mala calidad (C_3S_4) y con alto contenido de arsénico, se encontró un enriquecimiento de este elemento, paralela a una alcalinización y salinización incipiente.

La contaminación fue originada por el agua de riego debido a que no existe otra fuente de contaminación.

El contenido de arsénico soluble alcanza niveles tóxicos.

Se sugiere tener en cuenta este peligro en otros casos de irrigación con aguas ricas en arsénico.

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Stimulation of bean growth in coffee by exogenous application of ethylene

Sumario. El tratamiento de etileno antes de la cosecha en café Robusta resultó en un incremento insignificante en el peso seco de los frutos enteros. Pero estimuló la acumulación de materia seca en la cereza por encima de 15 por ciento. Este aumento se realizó a expensas del mesocarpio. Se sugiere que el etileno prolonga la etapa de llenado del endospermo del café al desviar las reservas hacia el grano, las que normalmente se depositarían en el mesocarpo.

ETHYLENE is extensively applied to hasten the ripening of a variety of harvested fruits (1). In coffee, where it is given as a pre-harvest treatment, the treated fruits continue to grow on the plant for several weeks until they are picked (6).

Besides its influence on ripening, it was suspected that ethylene would also affect fruit growth in coffee. The present study concerns this aspect.

Fruit bunches on *Coffea canephora*, Pierre ex Frochner (Robusta) were treated with 360 ppm of ethylene as described earlier (7). Fruit growth was measured in terms of fresh and dry weights.

The salient feature of this investigation is that ethylene promoted an accumulation of dry matter in the bean without registering a corresponding increase in the dry weight of whole fruit (Table 1). Ethylene appears to effect this by influencing the distribution pattern of reserves within the fruit's components. This is quite clear when the observed increase in bean growth (35.74 mg fruit^{-1}) is traced to the perceptible decrease in dry weight of mesocarp (34.39 mg fruit^{-1}) (Table 1.). Studies on the development of coffee fruits (2, 5, 8) reveal that in the endosperm-filling stage commencing from 19th to 29th week after anthesis, the reserves are continuously deposited in the bean. This is immediately followed by a ripening stage of about five weeks when the reserves are channelled into the mesocarp. Ethylene, which was applied in this work during the final phase of the endosperm-filling stage, appears to have prolonged this stage by favouring the accumulation of dry matter in bean in lieu of mesocarp. In addition to its impact on ripening, ethylene thus induced a significant increase in yield ($p<0001$) by promoting bean growth (15.49%). Enhancement of yield with ethylene has not been reported with any other plant material (1).

Table 1

Changes in fresh and dry weights of control and ethylene treated yhole fruits and fruit components

(Mean of 5 replications)

Material	Control	Treated	Control	Treated
	mg fresh weight		mg oven dry weight	
Whole fruit	1389	1637*	513.60	518.27
Exocarp (fruit wall)	588	608	144.17	140.15
Mesocarp (mucilage)	252	335*	93.79	59.40*
Endocarp (parchment layer)	56	63**	45.00	52.34**
Bean	479	623*	230.64	266.38*

*$P<0.001$ **$P<0.05$

Rest not significant at $P=0.05$ level

The time of ethylene application in pre-harvest treatments has a marked effect on fruit growth. Ethylene adversely affected the fruit growth of Early Black Cranberries when applied before bloom, but it was completely nullified when the treatment was programmed two weeks before the harvest time (3). In figs, application of ethylene during the early part of the "slow growth" stimulated growth and maturation, whereas the same treatment given during the later part of that phase had no significant effect on size or quality (4). The element of timing ethylene treatment in coffee plantations thus appears to have a decisive effect on the yield.

Abstract

Pre-harvest treatment of ethylene on Robusta coffee resulted in negligible increase in the dry weight of whole fruits. But it stimulated accumulation of dry matter in the bean substantially by over 15 per cent. This enhancement is at the expense of mesocarp. It is suggested that ethylene prolongs the endosperm filling stage of coffee by diverting the reserves to the bean which would otherwise ordinarily get deposited in the mesocarp.

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