

experiência brasileira demonstrou a eficiência do vento como agente de disseminação à distância. Porém, não é possível excluir a introdução acidental, por pessoas ou através de material vivo. Diante dessa tendência de dissiminação generalizada, seria importante um trabalho coordenado entre os países cafeicultores, de modo a garantir uma troca permanente de experiências, bem como, de material genético.

No Brasil a ferrugem em função das condições climáticas e da própria cafeicultura realizada, mostrou comportamento distinto àquele relatado nos países africanos. Estudos sobre a epidemiologia indicaram que para cada região, e conforme o ciclo productivo da planta, existirá uma demanda de tratamentos fitossanitários. Da mesma forma, equipamentos adequados para as diferentes condições das propriedades cafezeiras foram desenvolvidos e industrializados.

O desenvolvimento da situação da ferrugem na Nicarágua, deverá ser acompanhado com expectativa. A extensão do ataque, a tentativa de erradicar ou não a moléstia. A erradicação no Brasil, apesar da mobilização geral após a identificação da moléstia, mostrou-se impraticável. Em pouco tempo foi possível verificar que a expansão da moléstia tinha sido tão rápida, que qualquer medida nesse carácter não se aplicaria ao Brasil. Fato semelhante poderá ocorrer na Nicarágua. No Brasil a generalização da moléstia levou quatro anos, e o mesmo comportamento poderá ocorrer em outras regiões.

O Brasil demonstrou ser compatível conviver com a ferrugem, mantendo a cafeicultura competitiva com outros productos agrícolas. A preocupação maior deverá ser dirigida aos cafezais existentes. O tempo apenas permitirá que o uso de variedades resistentes passe a ser feito, e possa ser adotado em maior escala.

7 fevereiro 1977.

IVAN JOSE ANTUNES RIBEIRO
MAURO HIDEO SUGIMORI
OSVALDO PARADELA FILHO
LOURIVAL CARMO MÔNACO
INSTITUTO AGRONÓMICO
CAMPINAS, SÃO PAULO
BRASIL

REFERÊNCIAS

1. CHAVES, G. M., CRUZ FILHO, J., CARVALHO, M. G., MATSUOKA, K., COELHO, D. T. e SHIMOYA, C. A ferrugem do cafeeiro (*Hemileia vastatrix* Berk et Br.) Revisão da literatura com observações e comentários sobre a enfermidade no Brasil. Seiva 30 (Nº especial) 1-70. 1970.
2. OLIVEIRA, B. D. e RODRIGUES Jr., C. J. O problema das ferrugens do cafeeiro. In: Primeira Reunião Técnica de F.A.O. - C.C.T.A. Sobre a produção e proteção de cafeeiro Abidjan. Costa do Marfim. Comunicações da Delegação Portuguesa. 1960. pp. 89-133.
3. RIBEIRO, I. J. A., SUGIMORI, M. H., MORAES, S. A. e MÔNACO, L. C. Raças fisiológicas de *Hemileia vastatrix* Berk et Br no Estado de São Paulo. Summa Phytopathologica 1(1): 19-22. 1975.
4. SCHIEBER, E. Present status of coffee rust in South America. Annual Review of Phytopathology 13: 375-382. 1975.

Effect of ethrel on carbohydrate fractions of *Coffea arabica* L. fruits

Sumario. Aspersiones de ethrel acuoso (240 ppm a 500 ml por planta) aceleraron la maduración de frutos de *Coffea arabica* L. cv 'S.795' y provocaron algunos cambios cuantitativos en el metabolismo de carbohidratos, que no fueron ni adversos fisiológicamente ni afectaron la calidad del sabor de la bebida, comparadas con las plantas testigo, sin aspersiones.

Ethrel or ethephon or CEPA (2-chloroethy) phosphonic acid (an Amchem product, Ambler, U.S.A.) releases ethylene in plant tissues (2), affecting numerous physiological processes including hastening of fruit ripening which is commercially important (11). Aqueous sprays of ethrel hasten fruit ripening in coffee also (4, 9, 7, 5, 6). In view of the changes in carbohydrate metabolism during natural ripening of fruits (11), and due to the importance of carbohydrates in beverage quality (12, 1), the effect of ethrel on carbohydrate fractions in different fruit components of arabica coffee was studied.

During 1974 crop season, a field trial was carried out on hastening of fruit ripening with ethrel using *Coffea arabica* L. cv 'S.795' (19 years old). The plants were grown under natural shade at Central Coffee Research Institute. The fruits were sprayed with aqueous solution of 240 ppm ethrel (0.25 ml ethrel in 500 ml water per plant), when they were physiologically mature and green. Three weeks after spray, fully ripe fruits were collected from 25 each of sprayed and control (unsprayed) plants (one replication). Fruit wall (exocarp), mucilage (mesocarp), parchment (endocarp) and seed were separated, and their reducing, non-reducing and total sugars (3) and starch (8, 10) were determined.

The distribution pattern of carbohydrate fractions in different components of naturally ripe fruits of control (unsprayed) plants could be seen in Table 1. In the fruits of ethrel sprayed plants, the content of reducing sugars decreased by 26,35 and 19% in fruit wall, mucilage and seed, respectively, as against the respective fruit components in control. Whereas non-reducing sugars increased by 68 and 32% in fruit wall and mucilage, and decreased by 30 and 3% in parchment and seed, respectively, with ethrel spray as compared to control. In the fruits of ethrel sprayed plants, total sugars decreased by 1, 15, 21 and 7% in fruit wall, mucilage, parchment and seed, respectively, as against control. Starch content of fruit wall, mucilage and parchment decreased by 4,9 and 13% respectively, and increased by 12% in seed with ethrel spray, when compared to control. While total carbohydrate (total sugars + starch) of seed increased by only 2%, it decreased by 7, 11 and 15% in fruit wall, mucilage and parchment, respectively, with ethrel spray, as against control.

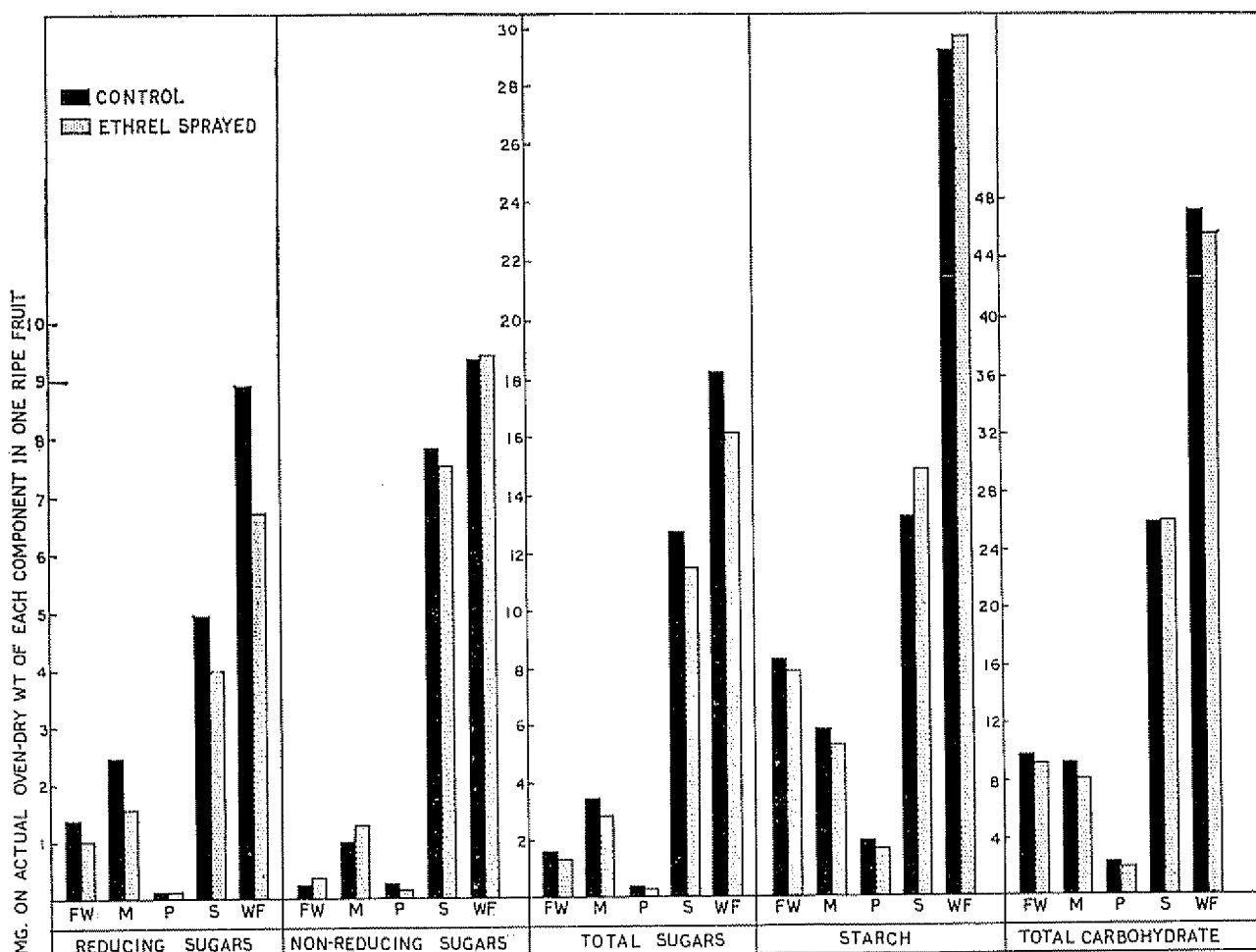


Fig 1—Effect of ethrel spray on carbohydrate fractions in different components of ripe fruits (expressed as mg./actual oven-dry weight of each component in one ripe fruit) of arabica coffee 'S 795' plants. FW: Fruit wall, M: Mucilage, P: Parchment, S: Seed, WF: Whole fruit

More or less a similar trend in the changes of carbohydrate fractions was obtained when the results were calculated on the actual oven-dry weight of each component in one ripe fruit of ethrel sprayed plants as compared to control (Fig 1). In one ripe fruit, reducing sugars decreased by 25%, with ethrel spray as against control.

The changes in carbohydrate fractions in fruits of ethrel sprayed plants indicate that respiratory activity might have been increased during stimulation of ripening process due to release of ethylene with ethrel spray as revealed by considerable decrease in reducing sugars (respirable substrate) in all the fruit components (except parchment) as compared to control. A decrease in starch content of fruit wall and mucilage with ethrel spray as against these fruit components of control, further support that the degree of shift from starch to sugar was relatively more with ethrel spray, as against control. Hydrolysis of starch into sugars is a

common metabolic change during natural ripening process in fruits (11). Ethrel spray hastened fruit ripening and brought out some quantitative changes in carbohydrate metabolism as described above, which were not in any way physiologically adverse. Cup quality tests of clean coffee samples were made by Quality Control Officer, Coffee Board, Bangalore, India, and found that ethrel spray did not affect the beverage quality of seed and the flavour was on par with seed of control plants*.

Summary

Effect of aqueous ethrel (240 ppm, at 500 ml/plant) spray on changes in carbohydrate fractions (reducing, non-reducing and total sugars and starch) in

* The authors are grateful to Dr. G.I.D. Souza, Director of Research for encouragement. They also thank Messrs. Agromore Limited, Bangalore for the free experimental sample of ethrel.

different components (fruit wall, mucilage, parchment and seed) of ripe fruits of *Coffea arabica* L. cv 'S 795' was studied. Ethrel hastened fruit ripening and resulted in some quantitative changes in carbohydrate metabolism, which were neither physiologically adverse nor affected the flavour quality of the beverage of seed, as compared to control (unsprayed) plants.

N. H. GOPAL, D. VENKATARAMANAN
DIVISION OF PLANT PHYSIOLOGY
CENTRAL COFFEE RESEARCH INSTITUTE
COFFEE RESEARCH STATION 577 117
CHIKMAGALUR DISTRICT
KARNATAKA STATE, INDIA

REFERENCES

- 1 AMORIM, H. V. de. Chemistry of Brazilian green coffee and the quality of the beverage. I. Carbohydrates. *Turrialba* 21(2): 211-216. 1971
- 2 APPLICATION OF ethrel in agricultural production. Ambler, Pa. Amchem Products, 1975. 21 p. (Information Sheet 53)
- 3 ASANA, R. D. and SAINI, A. D. Studies on physiological analysis of yield. *Indian Journal of Plant Physiology* 5:128-171. 1962.
- 4 BROWNING, G. and CANNELL, M. G. R. Use of 2-Chloroethane phosphonic acid to promote the abscission and ripening of fruit of *Coffea arabica* L. *Journal of Horticultural Science* 45: 223-252. 1970
- 5 GOPAL, N. H. Hastening of fruit ripening in robusta coffee. *Indian Coffee* 40:23-24. 1975
- 6 ———. Hastening of fruit ripening in coffee with ethrel. *Planters' Chronicle* 71(5): 167-169. 1976
- 7 ——— and VASUDEVA, N. Effect of ethrel on ascorbic acid of coffee fruits. *Current Science* 11:597. 1975
- 8 McCREADY, J. et al. Determination of starch and amylose in vegetables. *Analytical Chemistry* 22:1156-1158. 1950
- 9 OYEBADE, I. I. Effect of preharvest sprays of ethrel (2-chloroethane phosphonic acid) on robusta coffee (*Coffea canephora*) berries. *Turrialba* 21:142-144. 1971
- 10 PATEL, R. Z. A note on seasonal variation in starch content of different parts in arabica coffee trees. *East African Agricultural and Forestry Journal* 36:1-6. 1970
- 11 PRATT, K. H. and GOESCHL, J. D. Physiological roles of ethylene in plants. *Annual Review of Plant Physiology* 20:541-581. 1969
- 12 SIVETZ, M. S. M. Coffee processing technology. Vol. 2. Westport, Conn. Avi Publishing. 1963. 379 p.

RESEÑA DE LIBROS

BIRD, J. y MARAMOROSCH, K. (ed). Tropical diseases of legumes. New York, Academic Press. 1975. 171 p.

Este libro, como dicen sus editores, está orientado hacia las necesidades de los países tropicales, especialmente aquellas de Centro y Sur América, área del Caribe y Oeste de África, en el campo de la patología de leguminosas. Ciertamente existía un vacío en la literatura fitopatológica de enfermedades tropicales de las leguminosas, ya que no había hasta la fecha una publicación especializada en el tema. Esta publicación es el resultado de un "Taller" realizado en junio de 1974 en la Estación Experimental Agrícola de Río Piedras de la Universidad de Puerto Rico. Como dice el Prefacio, luego del "taller", se tomó la decisión de editar y publicar los trabajos presentados en dicha reunión. Por esta razón uno encuentra en el libro muchos datos experimentales no publicados, literatura reciente y aun temas de naturaleza histórica o especulativa. Este contenido cabe muy bien dentro de los propósitos que, a juicio de los editores, pretende alcanzar el libro.

Sin embargo, el título de la obra no encaja muy bien en estos propósitos ni mucho menos con su contenido. Así tenemos que se inicia sin ningún preámbulo o consideraciones generales acerca de la patología de leguminosas. Su primer capítulo Enfermedades de Tipo Rugoso (aquellas transmitidas por la mosca blanca (*Bemisia tabaci*)) se compone de 7 traba-

jos que se extienden en 85 de las 171 páginas que contiene el libro. Luego, el capítulo siguiente, Enfermedades Tipo Mosaico presenta 6 trabajos expuestos en 43 páginas. El capítulo 3, Enfermedades Bacterianas, Control Químico y Ecología de Patógenos, como su nombre lo indica es un capítulo heterogéneo con trabajos de muy diversa índole. Comprende cuatro artículos, uno de Bacterias portadas en la semilla de soja y su efecto sobre la germinación y emergencia, otro sobre control de enfermedades en frijol de costa, otro sobre evaluación de población de nematodos en *Cajanus cajan* y otro de tipo genreal sobre la importancia de las enfermedades en relación a los programas de investigación de leguminosas de grano en la región Este del Caribe. Finalmente el capítulo 4 y último titulado Origen, Mejoramiento y Perspectivas del Frijol común consta de 2 trabajos que abarcan 7 páginas.

Como se puede observar, el libro presenta un notable desbalance propio de muchas obras con autores colectivos. Tiene el mérito de ofrecer mucha información valiosa en forma de trabajos separados que se han tratado de agrupar un poco forzadamente con el fin de estructurar un todo lógico. El desbalance mencionado parece obedecer en parte a la especialidad de los editores. Así el 75 por ciento del contenido del libro trata de enfermedades virósicas o semejantes; casi todos los trabajos tratan de enfermedades de frijol común, aunque no por eso se han incluido algunas tan importantes en el frijol cultivado en el trópico como la